plating

JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

OTEL STATLER-HILTON

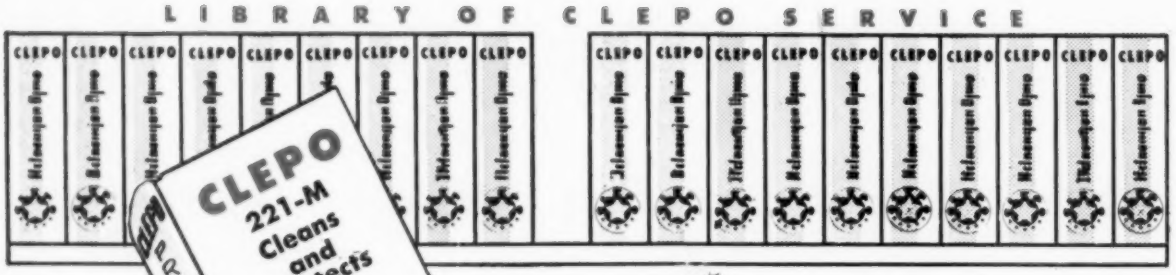
HOTEL SHERATON-CADILLAC

A HALF CENTURY OF SERVICE TO ELECTROPLATING, METAL FINISHING AND ALLIED ARTS

GOLDEN JUBILEE
1959

MAY - 1959

University Microfilms
313 N. First St.
Ann Arbor, Michigan



SUCCESS STORY

brings unusual response

Not long ago, we told the story of our new outstanding electrocleaner, CLEPO 221-M, and how a progressive plating shop in New Jersey found that the advantages we claimed for it were indeed facts, not just talk. They stated that CLEPO 221-M

- **DOES produce a whiter steel surface for plating**
- **DOES not give off obnoxious fumes during use**
- **DOES last longer and requires less compound for maintenance**

The response to this ad from you in the plating industry has been most gratifying. Since then, many other platers have converted to this modern steel electrocleaner, CLEPO 221-M.

If you are currently plating steel stampings, wire goods, etc., and are not quite satisfied with the results obtained with your present cleaning method, we would suggest that you investigate CLEPO 221-M for your work.

FREDERICK

2-FG5

GUMM *Chemical Company Inc.*

538 FOREST STREET, KEARNY, N.J.

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 500.

These Enstrip Metal Strippers work between shifts!

Nickel plated scissors on left were immersed overnight in an Enstrip A solution and left without supervision. Next morning (see right) they were down to bare steel ready for replating.

How would you like to dump your rejected plated parts into a stripping solution and "forget" them? Next morning, there they are, completely stripped and ready for replating! That's what Enstrip S and Enstrip A can do for you. These patented products of Enthonics research are alkaline solutions that dissolve nickel, copper, brass, silver, zinc and cadmium plate without attacking steel basis metals. Even when parts remain in the bath for hours after completion of stripping, the base metal remains as bright and shiny as it was prior to original plating.

Enstrip S and Enstrip A solutions operate at room temperature. No temperature, voltage or current to control. No electrical contacts to keep tight. Never any need to "rescue" the work upon completion of stripping. If you want rapid stripping, Enstrip S and Enstrip A solutions, operated at elevated temperatures, will dissolve .0015" of nickel or .0030" of copper per hour!

Write for the handy Enstrip Selection Chart which gives complete information about these new Enstrips, along with Enstrip 165 S (to dissolve nickel from copper and brass); Enstrip T-L (to dissolve soft solder, tin, and lead from steel and copper base alloys); Enstrip L-88 (to anodically remove copper, nickel, and chromium from zinc base die castings in a single operation), and many others. Enthone Incorporated, 442 Elm Street, New Haven, Connecticut.

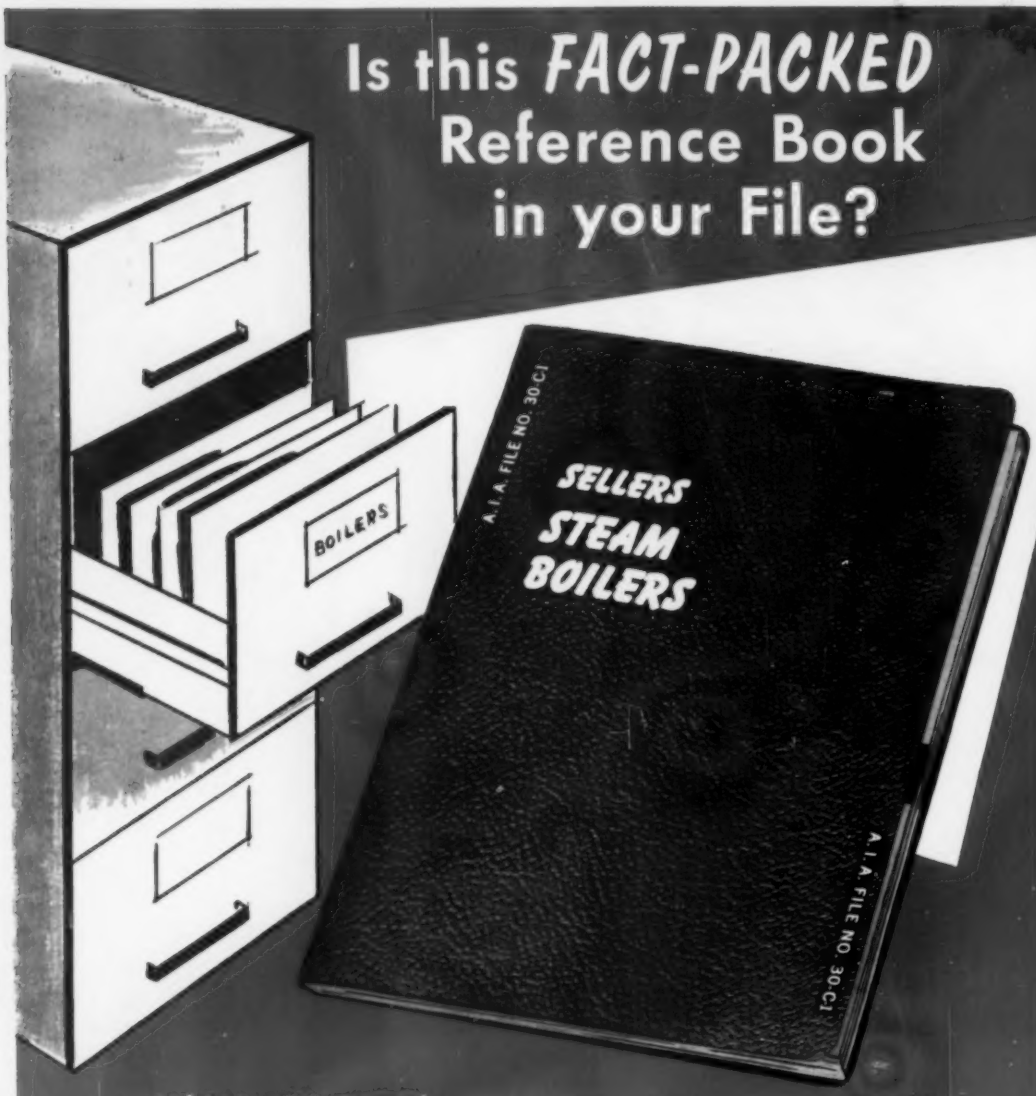
ASARCO

ANOTHER PRODUCT OF Enthonics RESEARCH

ENTHONE

A Subsidiary of American Smelting and Refining Company

Is this *FACT-PACKED* Reference Book in your File?



Subjects Discussed:

- Safe, Complete Combustion
- No open flame
- Maximum Heat Transfer
- Overcoming Building Vacuum and Chimney Back Draft
- Easy Accessibility
- Simple Design, Low Cost Maintenance
- Low Cost Installation
- Self-Cleansing Tubes that save fuel

Sellers
ENGINEERING COMPANY

4876 N. CLARK STREET CHICAGO, ILL.

Use this Handy Coupon

SELLERS ENGINEERING COMPANY
4876 N. Clark St., Chicago 40, Ill.

Please send the binder with the full story of Sellers Steam Boilers

Name_____

Company_____

Address_____

Town_____ Zone____ State_____

An Educational Society for the Advancement of Electroplating, Metal Finishing and Allied Arts

John P. Nichols
Chairman, Editorial Board and Managing Editor

Rodney Leeds
Editor

Donald C. Austin — **James H. Lindsay**
Dr. Abner Brenner — **Dr. Abraham M. Max**
G. Ross Davidson — **Walter L. Pinner**
S. Lewis Doughty — **William H. Safranek**
Robert A. Ehrhardt — **William M. Tucker**
Editorial Board

Anne V. Phalon
Editorial Assistant

Thomas W. Lowe
Production Manager

Ann B. Marsh
Circulation Manager

Ralph F. Scholbe
Advertising Manager

Loretta B. Ehrhardt
Advertising Assistant

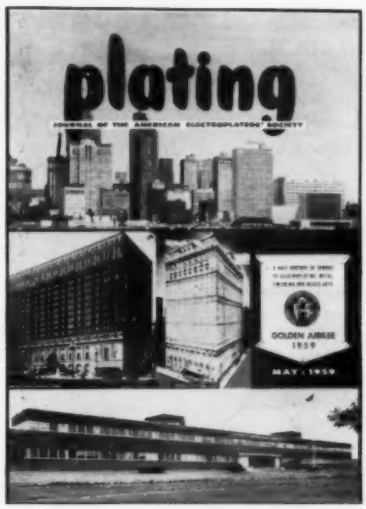
Bob Wettstein & Associates
Western Advertising Representatives

Los Angeles 57
672 S. Lafayette Park Place
Phone: DUnkirk 8-2286

San Francisco 8
353 Stockton Street
Phone: YUkon 2-9537

Portland 5
921 SW Washington Street
Phone: CApitol 8-4107

SOCIETY of BUSINESS MAGAZINE EDITORS



Cover Designed by James A. Civille.

plating
JOURNAL OF THE AMERICAN ELECTROPLATERS' SOCIETY

MAY 1959 — **Vol. 46, No. 5**

EDITORIAL:

International Exchange 443
by W. Andrew Wesley

Finishing Satin Chrome Built-In Ovens 463
by Stanley J. Beyer

Progress in the Development of a Nonembrittling Cadmium Electroplating Process 467
by P. N. Vlannes, S. W. Strauss and B. F. Brown

The Corrosion Resistance Of and an Evaluating Method For Various Electrodeposits on Steel 469
by Heinz W. Dettner

A New Economic Method of Treatment of Stainless Steels Prior to Cadmium Plating from Conventional Cyanide Solutions 481
by Larissa Domnikov

The Electroplating of Tin and Tin Alloy Solderable Coatings on Ferrous and Non-Ferrous Basis Metals .. 484
by A. M. Howard and L. R. Rogers

Report of Semi-Annual Meeting of Committee B-8 of ASTM 488
by Edward B. Saubestre

AES Golden Jubilee Convention Program 499

International Conference on Electrodeposition and Metal Finishing Program 501

Fifth Industrial Finishing Exposition Exhibitors 507

AES Directory	544	Future Meetings	543
AES Membership Report	541	Industry News	515
AES News	491	Industry News Briefs	517
Article References	520	Index to Advertisers	545
Books	456	Intersociety News	512
Branch News	528	Patent Abstracts	518
Classified Advertisements	542	Personals	526
Equipment and Supplies	521	Trade Literature	525

Published by the American Electroplaters' Society, Incorporated, 445 Broad Street, Newark 2, N. J. Phone: HUmboldt 2-3400. Yearly subscription for Members $2.00. Nonmembers U. S. and Canada $5.00. 65c a copy. Foreign, $8.00 a year. $1.00 a copy. Nonmember back issues, six months or older, $1.00 a copy.
Copyright, 1959, by the American Electroplaters' Society, Incorporated.
PLATING is indexed in Applied Science and Technology Index and abstracted regularly in Chemical Abstracts, Metals Review, Metallurgical Abstracts, Engineering Index, Technical Data Digest, and Bulletin Analytique.
Statements of fact and of opinion given in articles and papers in PLATING are those of the contributors. The American Electroplaters' Society assumes no responsibility for them.
Articles appearing in this publication may not be reproduced in full or in part without express permission of the Managing Editor.
Published monthly at 5800 N. Marvine St., Philadelphia 41, Pa. Second class postage paid at Philadelphia, Pennsylvania.

UNMATCHED CORROSION RESISTANCE

The No. 1 Feature of

HARSHAW PERFLOW PERGLOW DUPLEX *Nickel Plating Process*

Harshaw's research and development laboratory solved the problem of plating nickel on nickel. This, coupled with the use of a sulfur-free nickel plate and a bright nickel from a compatible bath, has made possible a Duplex deposit with unequalled corrosion resistance.

EXCELLENT CORROSION PROTECTION ACHIEVED THROUGH USE OF A SULFUR-FREE DEPOSIT

The Harshaw Chemical Company after years of research and development work was the first to find that a *sulfur-free* nickel offers greater corrosion resistance. This fact led to the development of the Harshaw Perflow nickel plating process. Further research showed that use of the sulfur-free Perflow nickel deposit as a base coating, followed by a bright nickel deposit from a *compatible* bath, would give a Duplex deposit with a further improvement of corrosion resistance. Performance data, by both accelerated tests and outdoor exposure, from leading automobile manufacturers and parts suppliers indicate that the Harshaw Perflow-Perglow Duplex nickel plate is comparable to and frequently better than, buffed gray nickel and is unequalled by any bright nickel.

MANY OTHER ADVANTAGES

1. Exceptionally high plating speeds —with air or mechanical agitation.
2. Excellent Chrome Coverage.
3. Unsurpassed Leveling Characteristics.
4. Outstanding Brightness.
5. High Tolerance to Impurities.
6. Excellent Adhesion.
7. Excellent Ductility at Full Brightness.
8. Simplified Control — Stable over extended periods of operation.
9. Controlled Stress.
10. Uniform Protective and Decorative plate on both steel and zinc die castings.

THE HARSHAW CHEMICAL CO.

1945 EAST 97TH STREET • CLEVELAND 6, OHIO

Chicago • Cincinnati • Cleveland • Detroit • Houston
Los Angeles • Hastings-On-Hudson • Philadelphia • Pittsburgh

HARSHAW

EDITORIAL

INTERNATIONAL EXCHANGE

IT DOES NOT MATTER whether one is talking about an individual, a publication, an institution or a society—a sure sign of success is to become known in other countries. This criterion is certainly met by the AES as it celebrates its GOLDEN ANNIVERSARY. Our Society is recognized all over the world as an association of leaders of metal finishing technology in Australia, Canada and the United States. OUR journal PLATING and our TECHNICAL PROCEEDINGS are consulted in all countries to learn of new developments in metal finishing and for news of the industry. It is therefore fitting that an important place has been assigned in the GOLDEN JUBILEE Program to the numerous sessions of the Fifth International Conference on Electrodeposition and Metal Finishing.

The International Conferences are planned by a group known as the International Council for Electrodeposition. The Fourth Conference held in London in 1954 was considered a great success not only in the number of overseas delegates and the number of countries represented but also in the quality of the technical papers there read. There is every indication that new records will be made at the Fifth Conference if not in the number of foreign visitors, then in the number of papers and in the caliber of the authors. Some 44 papers will be presented at 11 sessions, necessitating the extension of the Detroit meeting into a fifth day.

We must not fail to understand the importance of international cooperation in the furtherance of the aims of our Society. Some of the foreign papers submitted for this conference deal with subjects in which American science or technology is not far advanced. These include ultrasonic cleaning, deposition from pyrophosphate solutions, the sulfur dioxide accelerated corrosion test, plating on aluminum, electrolytic polishing and so on. Foreign technologists tend to attach greater importance to theoretical developments in the fields of electroplating and corrosion than we do. On the business side, conferences of technical people tend to promote foreign trade. Many American finishing processes are licensed profitably abroad. On the social side, a little of the dignity displayed by foreigners in conduct of large meetings and dinners might rub off on us Americans without causing us to lose the charm of informality and good fellowship.

It is important for all American AES members to remember that we are the hosts at this conference. Let us seek out the foreign visitors. Talk with them. Make them welcome!

W. Andrew Wesley

Second Vice President

Now-28 ISOBRITE® PLATING BRIGHTENERS

For Zinc, Cadmium, Copper and White Brass

HAVE THE *FOUR* BIG FEATURES YOU ASKED FOR!

When the Allied line of brighteners, now known as ISOBRITE, had the famous ARP trademark on them, we made a survey to find out exactly what *you* wanted most in brighteners. Your answers helped guide our research and development staff in evaluating and consolidating our new line.

Now, here are the results—the industry's most complete line—28 *ISOBRITE Brighteners with these most-wanted features:*

1. LONGER LIFE

Your own records will show ISOBRITE Brighteners give longest possible life in rack or barrel plating operations.

2. BRIGHTNESS

You'll see for yourself that ISOBRITE Brighteners give a diamond-like sparkle that just can't be matched.

3. THROWING POWER

Even if your product has deep recesses, you'll get a uniform, all-over brightness that only ISOBRITE Brighteners can give you.

4. WIDER BRIGHT RANGE

ISOBRITE Brighteners operate efficiently over exceptionally wide current density ranges and have greater tolerance for temperature change.

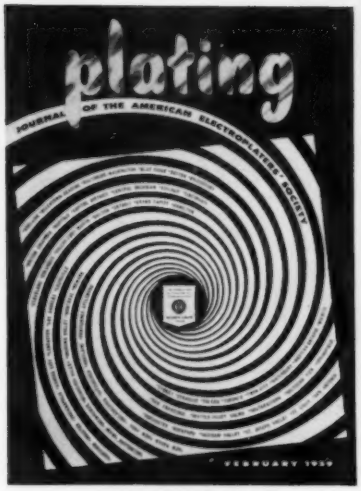
Remember, there's an ISOBRITE Brightener especially designed for your specific operations—whether you're rack or barrel plating zinc, cadmium, copper or white brass . . . an ISOBRITE Brightener that is entirely compatible with most other brighteners. Don't just order brighteners—specify ISOBRITE. There *is* a difference!

Your Allied Finishing Systems Engineer will be glad to discuss the benefits of ISOBRITE Brighteners in your operations. He's listed in your 'phone book under "Plating Supplies." Or, write for technical data and product list giving details of your operations.

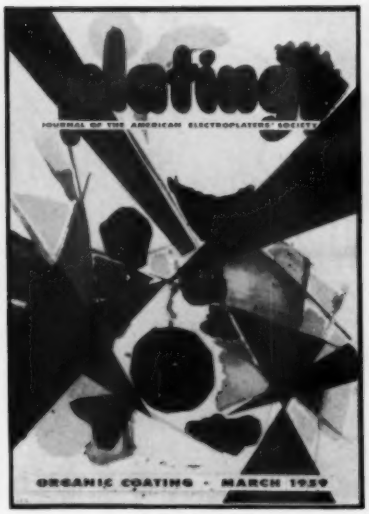
Allied Research Products, Inc. 4004-06 EAST MONUMENT ST., BALTIMORE 5, MD.
Branch Plant: 400 Midland Avenue, Detroit 3, Michigan
West Coast Licensee for Process Chemicals: L. H. Butcher Co.

Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing

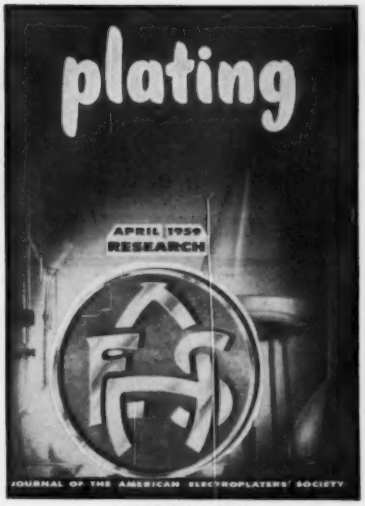
IRIDITE® Chromate Coatings | IRILAC™ Clear Coatings | ISOBRITE® Brighteners | ARP® Plating Chemicals | WAGNER Equipment



FEBRUARY 1959
GENERAL



MARCH 1959
ORGANIC COATING



APRIL 1959
RESEARCH

WHAT LIES AHEAD FOR PLATING MAGAZINE ADVERTISERS

JUST as a painting, a sculpture, a book can become a treasured possession, so too is PLATING MAGAZINE's unique GOLDEN JUBILEE Issue (June 1959) expected to earn prized status in the reference libraries of thousands of key individuals who as the brain, muscle or sinew of electroplating and metal finishing establishments of all kinds, compose the very might of the industry globally.

And for PLATING, now on the upward spurt of its planned, issue-by-issue improvement, its GOLDEN JUBILEE ISSUE is but the vanguard of a veritable procession of important issues to come.

As an advertiser or as an advertising agency of a company seeking to reach the core of the purchasing power of the rich electroplating and metal finishing field, each of these significant PLATING MAGAZINE issues ahead should interest YOU as a medium for transporting your merchandising message to the heart of this fertile market.

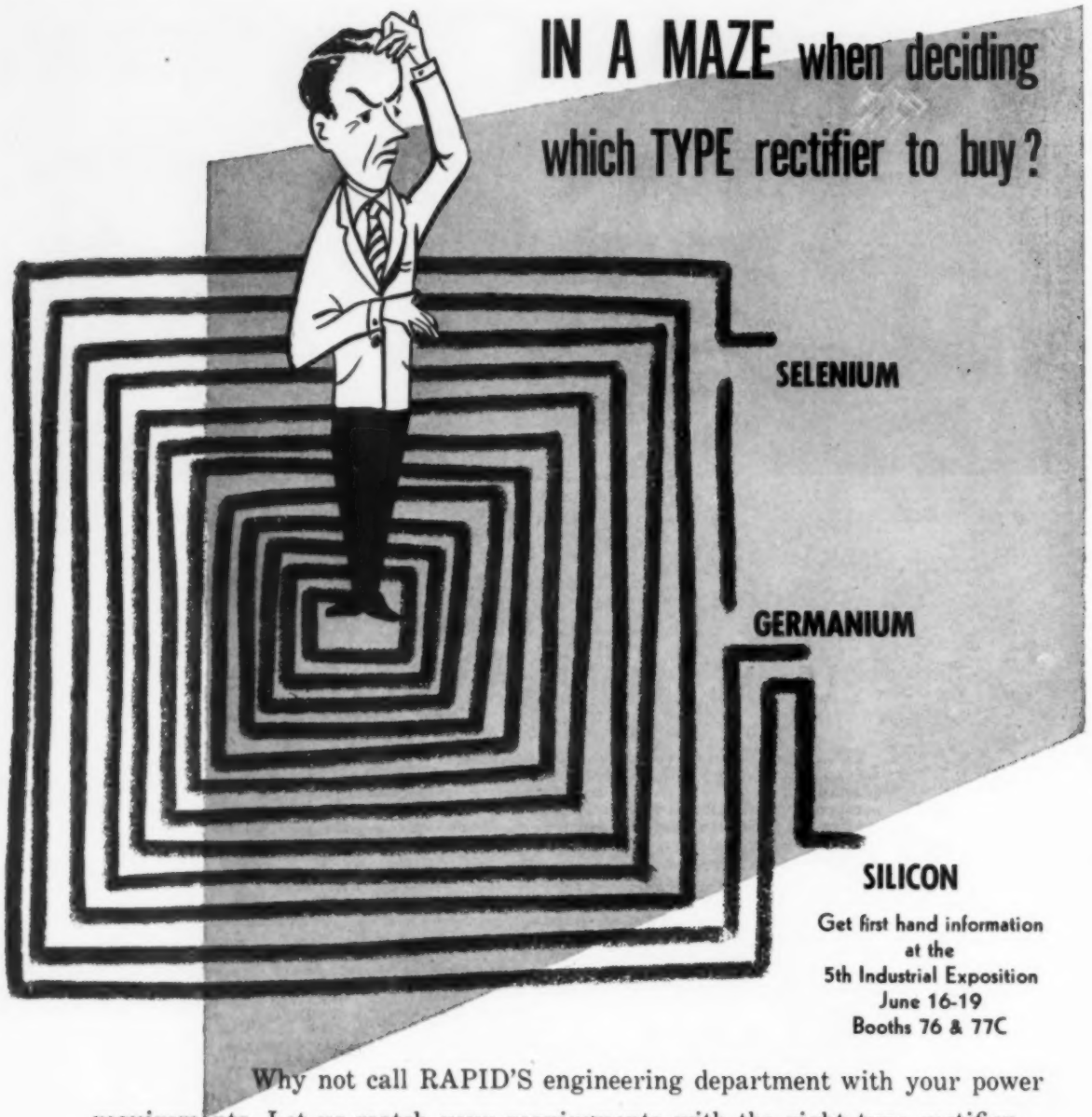
Aside from these monthly issues distributed to the largest paid circulation in this field, other values provided by PLATING MAGAZINE to its advertisers include, 1) lowest advertising rates, 2) stability demonstrated by the highest paid circulation renewal percentage in this field, 3) steadily burgeoning audience of prospective product buyers intimately, individually reached.

Without obligation of any sort, write or call PLATING's Advertising Department for a copy of its Rate Card and latest Publishers Statement for your comparison. Request a free copy of its popular "Market Data and Media File". Appraise, compare, then invest in PLATING MAGAZINE advertising. YOUR product and institutional merchandising will benefit from PLATING prestige, coverage, values.*

PLATING MAGAZINE

American Building, 443-445 Broad Street, Newark 2, N. J.
Phone: HUmboldt 2-3400

*Upon PLATING's acceptance of contract, and while its supply lasts, a handsome blue and gold easel (12" x 18") for displaying the company's own PLATING advertisements to its plant or office traffic is mailed free to each 1959 contract advertiser. Each regular advertiser, moreover, is also eligible to employ PLATING's direct mail service at nominal cost. Write for details.



Why not call RAPID'S engineering department with your power requirements. Let us match your requirements with the right type rectifier.

Because each semi-conductor has advantages to offer, and because RAPID supplies *all three*, you can be certain of obtaining sound technical advice.

Call TA 8-2200 for reliable technical service.

THE NAMEPLATE THAT MEANS *"More Power to You!"*

RAPID ELECTRIC COMPANY

12838 Fenkell Avenue • Detroit 27, Mich. • Diamond 1-8537

2881 Middletown Road • New York 61, N. Y. • TAlmadge 8-2200

THE

RELIANCE

LINE

61 YEARS OF FINISHING KNOW HOW

A RELIANCE PRODUCT FOR EVERY FINISHING REQUIREMENT

KUL-KUT BIAS BUFFS

Particularly adaptable to semi and full automatic operation

Fully ventilated for coolest operation

Removable or permanent centers— for interchangeability

Various types of cloth in every diameter, pucker & ply

For any application

RELIANCE SISAL BUFFS

For that tough cutting down job on steel or stainless steel

We manufacture a complete line of buffs, and whether it be bias, pieced or full disc type; cloth or Sisal— there is a Reliance Buff designed and constructed to handle every buffing requirement with the greatest efficiency and economy.

RELIANCE POLISHING & BUFFING COMPOSITIONS

EXTRUDED • MOLDED • LIQUID

They cut—They clean—They color—

For all metals and plastics, and for every buffing speed

Our Field Engineers are ready to help you with your polishing or buffing problem—They have the 'know how'; the buff, and, the compound to produce a quality job— FASTER, AND MORE ECONOMICAL. Why not call one in today? You will be glad you did.

Chas. F. L'Hommedieu & Sons Co.

MANUFACTURERS OF METAL FINISHING EQUIPMENT AND SUPPLIES

GENERAL OFFICE AND FACTORY

4521 OGDEN AVE. CHICAGO 23, ILL.

Charles B. Little Co.
Newark, N. J.

Branches:
Cleveland & Los Angeles

W. R. Shields Co.
Detroit, Mich.

plating leadership ✻

PLATING RESEARCH AT YOUR

world's largest plating supplier

the **udylite**

corporation

detroit 11, michigan

Your plated product has been made more salable, your markets broader, your profits greater thanks to intensive research conducted by Udylite of Detroit. Finishes, processes and solutions now widely in use stem from this research while many plating procedures that are standard had their beginning in Udylite laboratories. Finer, brighter finishes, greater corrosion resistance, increased volume and lowered costs have resulted. Today there is no other single source from which come so many contributions to the plating industry. To provide you with these benefits, Udylite maintains the wholly owned Udylite Research Corporation from which even now still more advances are on their way . . . from Udylite to you.

COMMAND FROM UDYLITE

...to increase sales and profits

✻ Continuing Research

Exposure testing in progress for more than 20 years is but a single phase of Udylite's continuous four point research program carried on in collaboration with industry.

In addition to these tests others are conducted at an oceanside site and test panels are mounted on cars to travel salt-treated winter streets. Similar panels are subjected to every type of accelerated corrosion test for comparison with other findings.

This counterbalance of testing methods furnishes a wealth of authentic data to guide industry toward better products for better service.

plating rejects ...with WYANDOTTE B. N.!

A message especially for Job Shop Operators:

HERE'S a cleaner that does *all* your job-shop cleaning – on steel, copper, brass, bronze, zinc-base die castings – gives you an efficient, round-the-clock job; cuts rejects, too!

The product? Wyandotte B. N. – a soak cleaner and versatile electrocleaner for direct and reverse cleaning.

Think of it! You need only one cleaner to take care of all job-shop needs!

B. N. gets metal so clean all over that bright plating really sparkles! It also cleans and activates nickel before chrome.

Wyandotte B. N. offers long life and maximum detergency. It is free rinsing; has high soil tolerance and concentrated alkalinity.

Switch to Wyandotte B. N. for *your* job-shop cleaning. Contact your nearest Wyandotte representative, or mail coupon, today! *Wyandotte Chemicals Corporation, Wyandotte, Mich. Also Los Nietos, Calif. Offices in principal cities.*

Wyandotte CHEMICALS

J. B. FORD DIVISION

The Best in Chemical Products for Metal Finishing

Wyandotte Chemicals Corporation
Dept. 3045 • Wyandotte, Michigan

Yes! I would like to know more about Wyandotte B. N. for use in metal-cleaning operations.

☐ **Have representative call** ☐ **Send more complete information**

Name _____ Title _____

Firm _____

Address _____

City _____ Zone _____ State _____

FREE DATA FILES

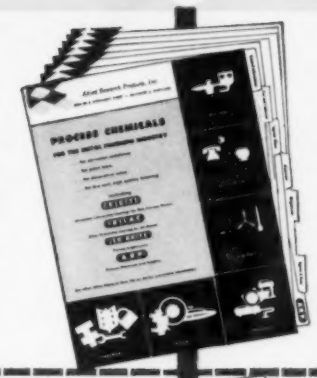
on

Allied Research LINES

LOOK FOR THE DIAMONDS—SIGN OF FINISHING QUALITY

METAL FINISHING PROCESSES

A complete line of quality products and processes developed primarily as a result of helping manufacturers like yourself solve their metal finishing problems. If one of our present products does not meet your needs, we'll be glad to work with you to find an answer to your problem.



IRIDITE® Chromate Conversion Coatings for Non-Ferrous Metals.

IRILAC™ Clear Protective Coatings for All Metals.

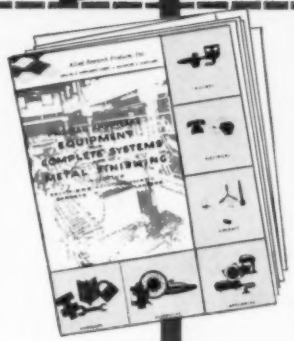
ISOBRITE® *Chemically Different* Plating Brighteners.

ARP® *Process chemicals.*

EQUIPMENT AND COMPLETE SYSTEMS

for Metal Finishing

Process Engineered—Single pieces of equipment or all equipment necessary for a finishing operation—evaluated, designed, fabricated, installed and tested to match exactly your particular process. Ask about our *Process Engineering Service.*



WAGNER RECTIFIERS

Silicon and Selenium, built to exacting specifications for long life, trouble-free service.

WAGNER AUTO-LOADERS

for fast, economical transfer of racks and parts, conveyors to plating machines, between conveyors.

AUTOMATIC AND SEMI-AUTOMATIC PLATING MACHINES

BARRELS, TANKS and other equipment.

CHEMICALS AND SUPPLIES

Prompt service on a wide variety of daily-use necessities for the plating room, delivered from warehouse stocks strategically located in cities in metalworking areas.

FLAT-TOP® **ANODES**

in copper and zinc.

LECTROCOP® **FLAT COPPER ANODES**

CADMIUM, WHITE BRASS AND TIN ANODES in most efficient shapes. Acid Replacements, Buffs, Chemicals, Cleaners, Maintenance Materials.

NICKEL RECASTING SERVICE

Ask your Allied Field Engineer about our Subscription Plan which combines your new nickel purchases with a service to recast *your* butts and spears, resulting in substantial savings.

Allied Research Products, Inc.

4004-06 EAST MONUMENT STREET
BALTIMORE 5, MARYLAND
Branch Office: 400 Midland Avenue, Detroit 3, Michigan

Chemical and Electrochemical Processes, Anodes, Rectifiers, Equipment and Supplies for Metal Finishing.

WRITE TODAY FOR COPIES of these useful files describing technical details of our complete line, OR, phone your Allied Field Engineer. He's listed under "Plating Supplies" in your 'phone book.

FOR THE FINEST PLATING FINISHES SKILLED HANDS CAN MAKE

CALL FOR THESE PACE-SETTING ROHCO® PRODUCTS, *DISCOVERED AND CONTROLLED IN THE HULL CELL:*

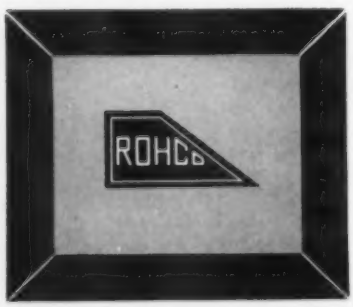
For unequaled, perfect Cadmium Plating . . .
ROHCO 20XL CADMIUM BRIGHTENER

For brilliant, low cost Zinc Plating . . .
ROHCO 100 BARREL ZINC BRIGHTENER
ROHCO 503 STILL AND AUTOMATIC ZINC BRIGHTENER

For retained beauty and added corrosion resistance . . .
RODIPS CD-3 AND CD-4 ON CADMIUM PLATE
RODIPS ZN-22 AND ZN-30 ON ZINC PLATE

Profit-making, successful platers are getting superb quality with preferred ROHCO Products. They know in today's competitive market nothing but the finest finishes can continually bring in repeat business from satisfied customers.

With the use of ROHCO Products, highest quality and absence of rejects are a matter of course in daily production. Keep in mind that these products must have a wide latitude of operation and ease of maintenance to earn the ROHCO Trade Mark.



Your Nearby ROHCO Representative is eager to work with you . . .

Nationwide Stockpoints

R. O. HULL & COMPANY, INC.
1302 Parsons Court Rocky River 16, Ohio

Complete Versatility *plus* One-Man Operation!

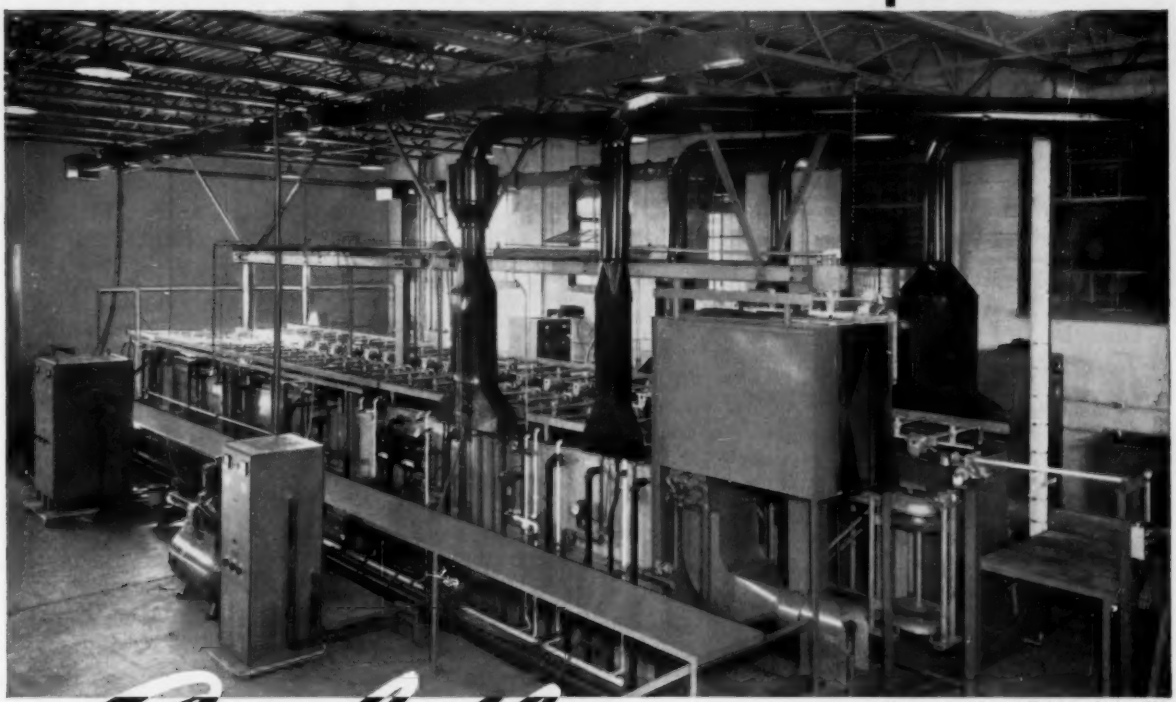


Photo courtesy General Finishers, Canton, Ohio

Cycleflex AUTOMATIC PLATING & ANODIZING MACHINE

QUICK CYCLE CHANGING Simply change positions of pick-up heads on transfer truss and alter tank partitions to suit. No expensive time-wasting overhauls—no rebuilding or other alterations

NO CONVEYOR BREAKDOWNS New electro-mechanical control, and safety devices, positively prevent racks from jamming into tank sides—keep load from dropping if power fails during work transfers

LOW HEADROOM All elevating mechanisms operate below top level of rack carrier

SELF-CLEANING CONTACTS Need practically no attention—insure positive six-point connections. Heavy duty design

EASILY REMOVED RACK CARRIERS Tank surfaces are kept clear—a big advantage when manual plating large workpieces, and when servicing

AUTOMATIC LOADING and unloading from double-spine racks is available if needed

DELAYED SET-DOWN ARRANGEMENT to work automatically with cycle, can be furnished where conversion coatings and bright dips are used

BY-PASSING can be built into machine where more than one cycle is required

Hydraulic operation, standard
Pneumatic operation, optional

Mail Coupon Now →

LASALCO, INC.

HOME OFFICE: 2820 LaSalle St. • St. Louis 4, Mo. • PRospect 1-2990
IN TEXAS: 2805 Allen St. • Dallas, Texas • Riverside 7-5814

Attach to Company Letterhead

Send complete information on fully automatic Cycleflex

Company.....
Street Address.....
City, Zone, State.....
Signed.....

Analysis... pH, and Thickness Testing made simple with KOCOUR TEST SETS

Regular Control is good practice

Nothing can surpass the economy and convenience of regular control. It helps prevent trouble. When you do have a problem, you can determine the cause quickly . . . especially, if you're equipped with control for analysis and pH for your various baths and Thickness Testing for your plated work.

Control Your Solutions With KOCOUR TEST SETS

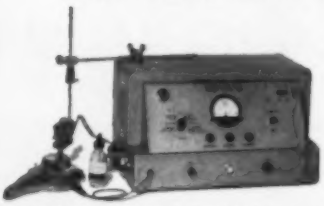
Kocour Test Sets provide the simplest, most direct analysis. Easy to use . . . no knowledge of chemistry required. Complete with glassware, reagents and directions.

For every plating purpose

KOCOUR Test Sets are available individually or in economical combinations for the control of plating, cleaning, pickling, anodizing, sealing, coating, passivating, desmutting, deburring, phosphorizing, heat treating, pH control and thickness testing. Write for your FREE copy of "Lab Hints for the Plater".

PLATING THICKNESS TESTING

Try a Model 955 on a 15-Day FREE Trial!



- direct reading
- virtually automatic
- 90–95% accurate
- simple operation

Model 955 determines the thickness of heavy or decorative chromium, silver, tin, cadmium, zinc, brass, copper, nickel, lead and other alloy deposits, on various basis metals (including COPPER-NICKEL-CHROMIUM-Composite Coatings). Write for Bulletin 400 and ask for details on a 15 Day FREE Trial!

● KOCOUR are specialists and pioneers in testing equipment for controlling plating — cleaning — pickling — anodizing — and hardening processes . . . special sets can be provided for your requirements.

Write today for further information—no cost or obligation.

KOCOUR COMPANY
4801 S. ST. LOUIS AVENUE
CHICAGO 32, ILLINOIS

Specify KOCOUR test sets from your supplier.

See us in Booths 67–68 at the I.F.E. in Detroit.

ORIGINAL

"pH PAPERS"

Accurate ph values in a few seconds right at the tank.

These are the original "pH Papers" invented and produced by an outstanding German chemist. They have proven their dependability for more than 20 years.

Indicator AND control-colors on SAME strip. Control-colors in steps of 0.2 pH and 0.3 pH.

Plating ranges
(200 strips of a range per box)

No.	Acid:	No.	Alkaline:
6074	(6.0– 7.4 pH)	6680	(6.6– 8.0 pH)
4862	(*4.8–6.2 pH)	7387	(7.3– 8.7 pH)
3650	(*3.6–5.0 pH)	8610	(8.6–10.0 pH)
2439	(*2.4–3.9 pH)	10113	(10.1–11.3 pH)
1028	(1.0–2.8 pH)	11131	(11.0–13.1 pH)
0414	(0.4–1.4 pH)		

*Electrometric Values in Nickel Solutions.

Each range is boxed separately

PAUL FRANK
118 East 28th Street NEW YORK 16
Tel. MU 9-5286

USE READER SERVICE CARD; INDICATE A 513.

FOR **SUPER-HEAVY** CUT
ALL METALS

AIRFLEX BUFFS

These are the "Garfield" Ventilated Bias Buffs • Stronger • Bias Cut Cloth Construction • Does not Fray or Ravel • Perfectly Balanced • Made of High Count Long-Fibre Heavy Weight Cotton • Last Longer • Assembled on Ventilated Steel Centers for Cooler Running • Allows Lower Compound Consumption and Retains Better Compound Head • Leaves No Streaks on Buffed Surfaces • Twice as Wide as Ordinary Buffs • Faster Set-Up Time • Less Machine Wear • Consistent Quality.

Full Range of Styles Available • Light Duty—Standard • Heavy Duty • Extra Heavy Duty. Made in 4 Center Sizes: 3", 5", 7", 9". In All Types of Cloth: 64/68, 80/92, 86/93 or Flannel.

Garfield
BUFF COMPANY

CAPITAL 6-7900

6 Clinton Road, Caldwell, N. J.

USE READER SERVICE CARD; INDICATE A 512.

USE READER SERVICE CARD; INDICATE A 514.

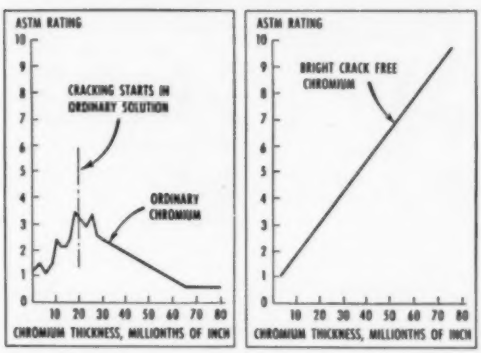
News about COATINGS FOR METALS

from Metal & Thermit Corporation

Thicker chromium plate increases corrosion protection

Thicker chromium in general, and Unichrome SRHS® and Crack-Free deposits especially, are doing more to increase protection against corrosion than any other change in decorative chromium plating in the past 25 years. Latest research demonstrates this.

As far back as 1928, it was shown that ordinary chromium plate soon reaches a critical thickness. (See graph A.) At a thickness of approximately .020 mils, the chromium cracks microscopically. Through these openings, corrosives can reach the



Graph A. Effect of increasing thickness of ordinary chromium on salt spray resistance . . . from Baker & Pinner data, SAE 1928. **Graph B.** Crack-Free Chromium ASTM corrosion ratings based on accelerated acetic acid salt spray tests.

undercoatings, and ultimately attack the base metal, ruining the appearance and function of the plated part.

Note, however, that before cracking commences, corrosion resistance *does* build up as the number of pores in the plate are reduced by the thicker deposit. Depending on undercoats, the effect of cracking can be modified.

DUCTILE CHROMIUM DOESN'T CRACK

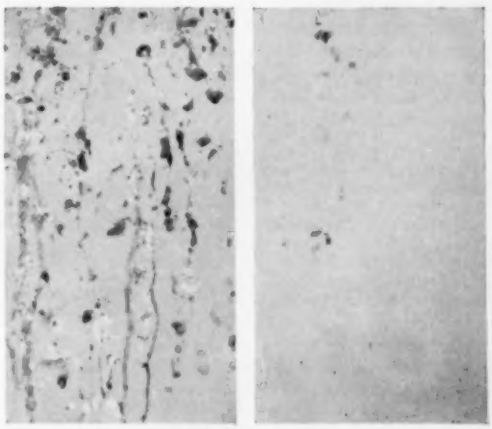
But see what happens in the case of Unichrome Bright Crack-Free Chromium. (Graph B.) An innovation in plating, it plates as thick as desired for practical purposes – entirely without cracks – and, as thickness increases, corrosion-admitting pores are eliminated. Protection keeps rising.

BETTER PROTECTION IN RECESSES

In the past, corrosion usually appeared in recessed areas of parts where little or no chromium could be plated to protect the base metal. This problem, too, is solved by Unichrome Bright Crack-Free Chromium which gives much better coverage and throwing power than previous processes.

LOW COST

The corrosion protection of decorative chromium can be improved several ways. Unichrome Crack-Free Chromium can be used alone or in combination with other fast plating SRHS chromium processes. Combination of chromium deposits, impossible from a practical standpoint for 25 years, is now done commercially with SRHS and Crack-Free Chromium, thereby eliminating need for new, larger tanks and saving thousands of equipment dollars.



Effect of thickness of CRACK-FREE Chromium over thin undercoatings (0.4 mil Nickel on steel) after 48 hours CASS test. Left—0.015 mil Chromium; right—0.045 mil Chromium.

A technical paper, "Thicker Decorative Chromium for Better Corrosion Resistance" gives more details. Write for your copy. METAL & THERMIT Corporation, Rahway, New Jersey.

METAL & THERMIT CORPORATION

Remittance must accompany all book orders placed with AES Headquarters.

Lubrication of Titanium, by N. Fatica, Clevite Research Center for Wright Air Development Center, U. S. Air Force. May 1958. 78 pages. Order direct PB 131981 from Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., $2.25.

Two testers, the Shell Four Ball and the Falex, were used in this investigation to obtain information about the frictional properties of modified titanium coatings. A comparison was made of the wear resistance of the best surface treatments with various lubricants. Correlation of wear rates with the frictional characteristics of the different systems was moderately successful in both testers. It appeared possible to obtain equivalent wear resistance in many cases using electroless nickel plates, cyanided, nitrided, carburized, oxidized, or carburized iron-plated titanium. The higher the halogen content of the lubricant, the better were its lubricating properties. It was noted that systems showing high wear rates in one type of tester will show high wear rates in the other. The conclusion was drawn that the essential nature of the action taking place in either tester is identical. Thus any lack of correlation must be attributed to operation in widely different pressure and temperature ranges. (Part 1 of this report was released earlier and is still available from OTS. It is PB 131650, same title, Part 1, Dec. 1957, 52 pages, $1.50.)

Delayed Failure and Hydrogen Embrittlement in Titanium, by R. D. Daniels, R. J. Quigg and A. R. Troiano, Case Institute of Technology for Wright Air Development Center, U. S. Air Force. Feb. 1958. 62 pages. Order direct PB 151139 from Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., $1.75.

The tendency for hydrogen induced delayed failure in an alpha-beta titanium alloy varied considerably with microstructure, according to this report. The material used was a commercial 4Al-4Mn alloy hot rolled in the alpha-beta region. As-received tensile strength was about 140,000 psi. Among many other conclusions, it was noted that a quenched structure was less susceptible to delayed failure than aged or annealed structures and that the tendency for failures was magnified in all structures by an increase in hydrogen content or an increase in strength level. Hydrogen induced failures occurred by a process of crack initiation and controlled crack growth. Delayed failures resulting from creep were encountered, even in notched specimens. At both high and low temperatures, hydrogen induced delayed failure disappeared and the time required for failure as well as the minimum stress at which failure could occur increased at elevated temperatures.

Effect of Prior Creep on Mechanical Properties of Aircraft Structural Metals: Part 3—C11OM Titanium Alloy, by J. V. Gluck, H. R. Voorhees and J. W. Freeman, University of Michigan for Wright Air Development Center, U. S. Air Force. May 1958. 96 pages. Order PB 151145 direct from Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., $2.25.

Prior creep-exposure of C11OM, an 8-per cent manganese binary titanium alloy, is reported to have little effect on the fracture strength or ductility in either tensile tests or tension-impact tests. Studies were made concerning the effect of exposure to elevated temperature creep conditions on the subsequent mechanical properties of the alloy. Exposures were conducted for periods of 10, 50, and 100 hours either unstressed or at stresses causing up to 3 per cent total deformation at temperatures between 650 and 800F. Exposure to temperature alone is said to have caused a decrease in the tensile yield strength and an increase in the compression yield strength depending on the exposure time and temperature. Plastic deformation either during loading, or principally during creep, is credited with causing an increase in the tensile yield strength and a decrease in compression yield strength from the values established by exposure to temperature alone. This behavior was attributed to a Bauschinger-type effect.

Growth and Perfection of Crystals. Edited by R. H. Doremus, B. W. Roberts and David Turnbull. 609 pages. Nonmembers $12.50. AES Members $10.35.

In August of 1958, 63 authorities gathered in Cooperstown, New York for the International Conference on Crystal Growth. The proceedings of this meeting, printed by the photo-offset process, are available in book form.

Growth and Perfection of Crystals was edited by R. H. Doremus, B. W. Roberts, and David Turnbull, all of the General Electric Research Laboratory which sponsored the conference together with the Air Force Office of Scientific Research. The keynote of the meeting—crystal morphology—is carried over here, and stock taken of our present understanding of this subject as well as its unsolved problems.

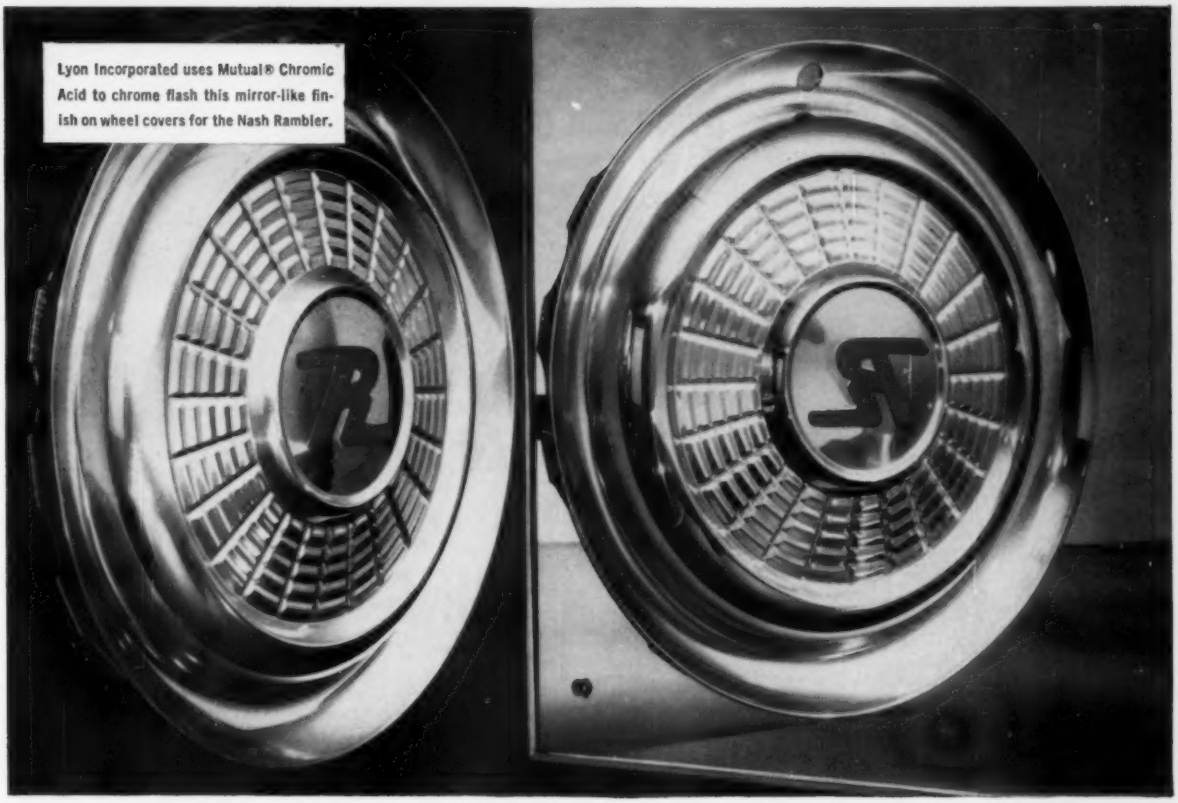
The editors have divided the voluminous material into six main sections, each containing a series of related lectures. The introductory lecture by F. C. Frank is followed by: Growth of Whiskers; Properties of Whiskers and Crystal Imperfections; Growth of Crystals of the Solvent Phase; Growth of Crystals of the Solute Phase; and Crystallization of Polymers. The papers investigate organic, inorganic, and polymeric substances from the standpoint of crystal perfection, the formation and structure of whiskers, the presence of dislocations, and the mechanism of crystal growth from the melt, solution and vapor. Further reports emphasize the important differences and similarities between polymer and ordinary crystallization

The Effect of Cadmium Plating on SAE 4340 Steel in the Presence of Stress Concentrations at Elevated Temperatures by E. M. Kennedy Jr., Wright Air Development Center, U. S. Air Force. Mar. 1958. 40 pages. Order PB 131814 directly from Office of Technical Services, U. S. Department of Commerce, Washington 25, D. C., $1.25.

As a result of this research, it was recommended that cadmium-plated high-strength steel not be used in applications where operating temperature approaches the melting point of cadmium. The study was conducted to determine the effect of cadmium plating on the tensile and stress rupture properties of high-strength steel at high temperatures. Service failures of cadmium-plated aircraft structural parts had indicated that stress combined with high temperature caused a sharp decrease in tensile strength. In studies of SAE 4340 steel in the annealed condition, it was shown that tensile properties are not affected by cadmium plating at 600F or 611F while under stress. Plating on the steel heat-treated to 240,000 to 260,000 psi tensile strength level causes a sharp decrease in the rupture strength at or near the melting point of cadmium (612F). However, it was observed that exposure of unstressed cadmium-plated parts to these temperatures causes no decrease in the tensile strength at room temperature.

1958 Book of ASTM Standards, Part 2. Non-Ferrous Metals Specifications (Except Test Methods), Electronic Materials, 1386 pp, 251 standards (October 1958). Nonmembers $10.00, members $9.00.

Aluminum and aluminum-base alloys; aluminum wire, rods, and standard conductors for electrical purposes; magnesium and magnesium alloys; zinc and zinc alloys; copper; copper and copper alloy wire and conductors; copper and copper alloy castings; copper alloy wire rods, bars, shapes; copper alloy pipe and tubes; copper and copper alloy plate, sheet, strip; die castings; lead and lead alloys; nickel and nickel alloys; lead- and tin-base alloys; titanium; solder and bearing metal; zinc; deoxidizers; electrical-heating and resistance alloys; metal powder products; electrical contact materials; electrodeposited coatings; materials for electron tubes, electronic devices and lamps



Lyon Incorporated uses Mutual® Chromic Acid to chrome flash this mirror-like finish on wheel covers for the Nash Rambler.

MIRROR FINISH THAT NEEDS NO BUFFING!

Chrome flashed by skilled plater using MUTUAL CHROMIC ACID

Experienced platers, like Lyon Incorporated, rely on high purity Mutual Chromic Acid to produce chrome plate that's decorative and durable. Combining careful control with Mutual Chromic Acid, Lyon produces a mirror-like finish which requires no buffing whatever after chrome plating! The plating is done over 301 Stainless Steel in a bath of slightly lower acid-sulfate ratio than that used for plating over nickel.

Mutual Chromic Acid is always 99.75% pure—or better. Its low sulfate content (less than 0.1%) makes it easy for you to control the acid-sulfate ratio of your plating bath. This safeguards against plating difficulties—and expensive rejects!

For technical information about Mutual Chromic Acid, send coupon for our free booklet, "Chromium Chemicals." Our Technical Service Staff will also be happy to answer your questions.

OTHER PRODUCTS FOR PLATERS

SOLVAY® Ammonium Bicarbonate • SOLVAY Caustic Soda
SOLVAY Hydrogen Peroxide • SOLVAY Methylene Chloride

Allied Chemical

SOLVAY PROCESS DIVISION
61 Broadway, New York 6, N. Y.

MUTUAL chromium chemicals are available through dealers and SOLVAY branch offices located in major centers from coast to coast.

SOLVAY PROCESS DIVISION 8-5
Allied Chemical Corporation
61 Broadway, New York 6, N. Y.

☐ Send Bulletin 52 "Chromium Chemicals"
☐ Have a representative phone for appointment

NAME _____
POSITION _____
COMPANY _____
PHONE _____
ADDRESS _____
CITY _____ ZONE ____ STATE _____

GET *ALL* THE ANSWERS TO *YOUR* FINISHING PROBLEMS

at the
FIFTH INDUSTRIAL FINISHING EXPOSITION!

(Held in conjunction with the
GOLDEN JUBILEE CONVENTION
of the
AMERICAN ELECTROPLATERS' SOCIETY)

The finishing experts will all be under one roof next June. In Detroit, at the Detroit Artillery Armory, from June 15 to 19, at the Fifth Industrial Finishing Exposition!

Take your problems to them. Get expert help . . . at the largest display of finishing equipment, materials and processes ever assembled under one roof.

Make a list of your plating problems. Take it to Detroit with you. See the men who man the booths. The experts with professional, up-to-date help for you. They'll be there to demonstrate the right way to solve your problems.

If you want more information on the Fifth Industrial Finishing Exposition *now*, ask the exposition chairman: • • • • • • • • • •

HOWARD J. McALEER
3171 BELLEVUE AVE.
DETROIT 7, MICHIGAN

To get the most out of your barrel finishing

ask Oakite

OVER 50 YEARS CLEANING EXPERIENCE • OVER 250 FIELD SERVICE MEN • OVER 160 MATERIALS

"Media-matched" Oakite compounds offer extra barrel-finishing economies

Any experienced barrel-operator can tell you that best results come from the right media and compound "mix"... where media and work are matched; and the compound matched not only to the work but also to the media.

Some signs of a good match: clean and efficient media; enough lubrication to assure a smooth finish; and faster cutting down, deburring or burnishing.

How to avoid a mismatch? That's where Oakite service can help you. Combine the Oakite man's experience with the tremendous variety of acid, solvent, and abrasive Oakite compounds available, and you're sure to be right.

In the complete line, there are compounds for fast cutting... finer finishes... tight tolerances... for steel, brass, aluminum, zinc, lead and various alloys... for hard water or soft. Ask Oakite which is the *right* one to help you get the most from *your* barrel. Bulletin F-9339 tells more. Write Oakite Products, Inc., 18 Rector Street, New York 6, N. Y.

it PAYS to ask Oakite

OAKITE

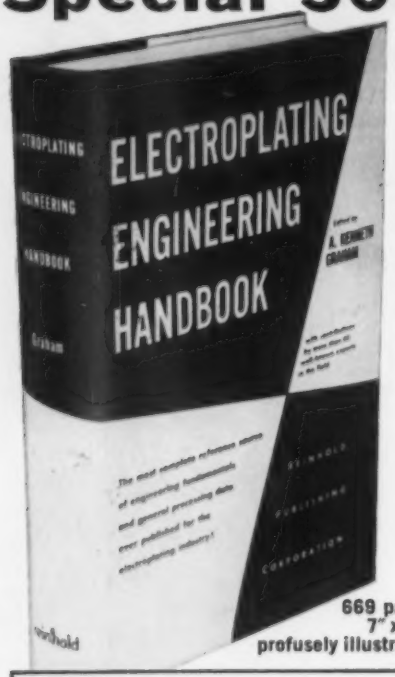
50 1909-1959 SCIENCE

years' leadership in industrial cleaning

Special 50th Anniversary Offer

to Members of the American Electroplaters' Society

In connection with its Golden Anniversary, the AES, through a special arrangement with the publisher, is pleased to offer its members an exceptionally low price on an outstanding reference book for electroplaters.



669 pages
7" x 10"
profusely illustrated

ELECTROPLATING ENGINEERING HANDBOOK

Edited by **A. KENNETH GRAHAM.** President of Graham, Savage & Associates, Inc. in collaboration with over 40 widely-known authorities in the electroplating field.

The complete data book long needed by everyone in the electroplating and metal finishing field. With this big, 669-page book at hand, you can quickly find the answer to practically every imaginable engineering or processing problem!

Jam-packed with tables, charts, plans and illustrations, this Handbook brings you all the most recent information available on processing techniques and the engineering factors involved in constructing and installing plating equipment. Full chapters cover the design of parts to be plated, metal surface preparation, standards and specifications, bath compositions, processing sequences, waste treatment, manual and automatic plating machinery, filtration, rinsing and drying, and all other engineering and operating considerations.

No matter what your interest in the electroplating field—engineer, designer, equipment manufacturer, executive, shop superintendent, purchasing agent, or user of electroplated parts—you'll find just the information you're looking for every time you use this *complete* Handbook.

Check This Wealth of Information

Glossary, **PART I**—GENERAL PROCESSING DATA. Tables of Data. Design for Plating. Metal Surface Preparation and Cleaning: Basis Metal Surface, Polishing, Brushing, and Buffing, Barrel Finishing Methods, Bulk Finishing Small Parts, Finishing Large and Precision Type Parts, Electropolishing, Metal Cleaning, Oxide Removal. Typical Processing and Operating Sequences. Water Requirements for Plating. Plating Bath Compositions and Operating Conditions. Plating Standards and Specifications. Trouble Shooting. Analysis of Plating Baths. Testing Electrodeposited Coatings. Waste Disposal. Plating and Metal Finishing Costs. Industrial Hygiene and Safety. Metallurgy for the Electroplater. Surface Protection and Finishing Treatments: Phosphate Coating Processes, Chromate Conversion Coatings, Chromic Acid Anodizing of Aluminum, Sulfuric Acid Anodizing and Oxide Treatments for Aluminum and Magnesium. **PART II**—ENGINEERING FUNDAMENTALS AND PRACTICE. Plant Location and Layout. Floors—Plans and Construction. Tanks. Linings. Heating and Cooling Practices and Equipment. Racks: Design, Construction, Insulation and Maintenance. Manually Operated Installations. Barrels. Semi- and Fully-Automatic Plating Machines. Continuous Plating Equipment for Steel Mill Products. Anode and Cathode Rod and Bus Systems. Exhaust Systems. Anodes and Cathodes—Types, Composition and Related Data. Low-Voltage D-C Generators. Rectifiers. Periodic Reverse Current Plating. Rinsing. Drying Practices and Equipment. Filtration. Auxiliary Equipment for the Plating Room. Maintenance. Index.

SPECIAL PRICE TO AES MEMBERS

1 copy $6.00
5 copies . . . . . 5.50 each
10 or more . . . . . 5.00 each

PRICE TO NON-MEMBERS: $10.00 per copy

NOTE: *All orders must be accompanied by payment in full.*

USE THIS CONVENIENT ORDER FORM

AMERICAN ELECTROPLATERS' SOCIETY
445 Broad Street, Newark 2, N. J.

Please rush_____copy (copies) of ELECTROPLATING ENGINEERING HANDBOOK

- ☐ at AES special anniversary member price
- ☐ at non-member price of $10.00 per copy

I am enclosing payment (or purchase order with payment) and understand the price includes free delivery anywhere in the U.S.A.

NAME (please print)_____

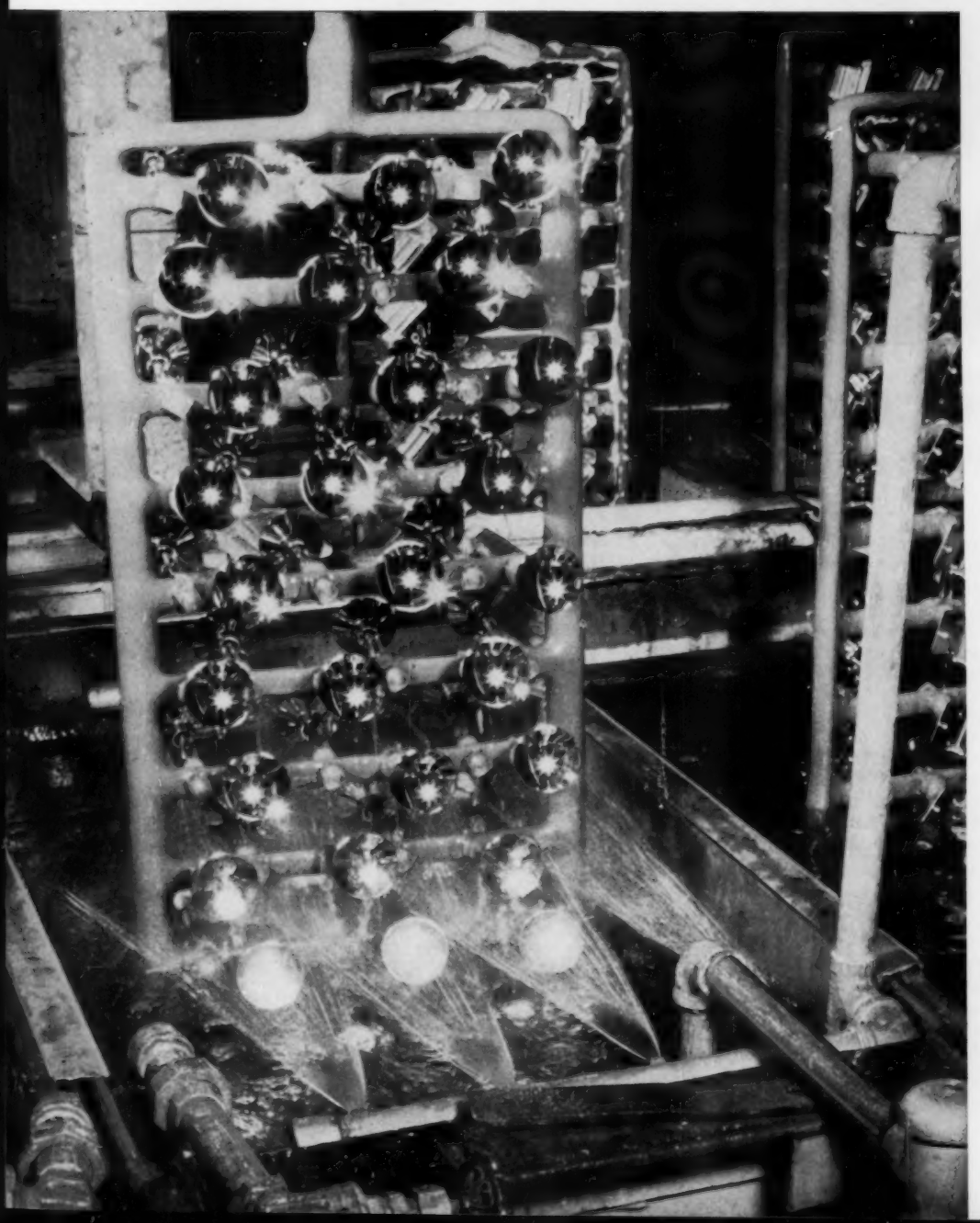
ADDRESS_____

CITY & ZONE_____ STATE_____

INDICATE A 518.➤

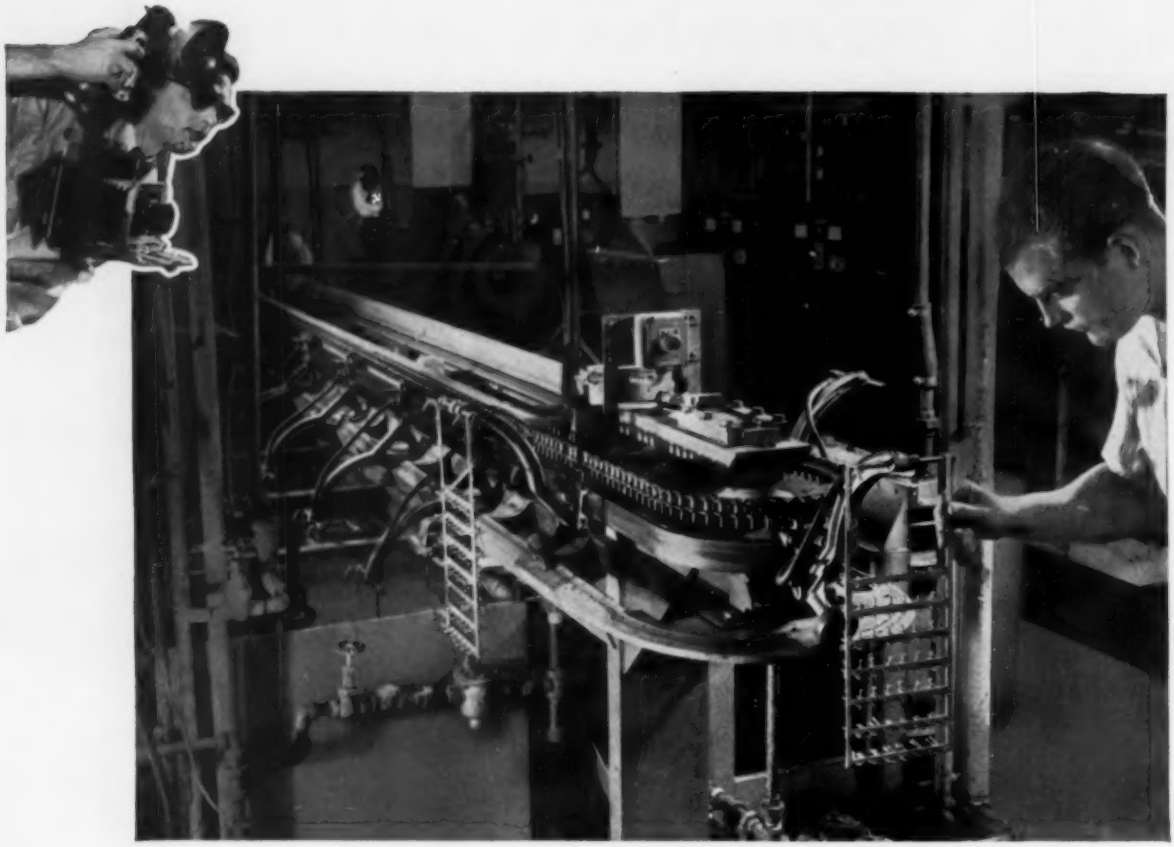
Get the extras that cut costs and guarantee consistent results... Competitively tested materials, comprehensively and conscientiously serviced by a nationwide network of sales engineers and distributors. Federated's materials include new ASARCO-MAX COPPER anode, triple-life Conducta-Core lead anode, copper, zinc, tin, tin-lead, cadmium, brass and silver anodes. Nickel salts. Zimax, Nimax, Cadmax brighteners. New Conmax conversion coatings for zinc and cadmium plated parts. Federated Metals Division of American Smelting and Refining Company, 120 Broadway, New York 5, N. Y. In Canada: Federated Metals Canada, Ltd., Toronto and Montreal.

FEDERATED METALS DIVISION OF



ASARCO

AMERICAN SMELTING AND REFINING COMPANY



Graflex finds "LITTLE STEVE" improves quality . . . reduces costs

More companies like Graflex, Inc. are learning of the versatility of the "Little Steve" plating and processing machine. It's an amazing producer for a machine of its small size and low original cost. It can plate up to 40,000 pieces per day — 540 racks per hour.

Graflex manufactures the world-famous Speed Graphic and Super Graphic press cameras, 35mm and reflex amateur cameras and a complete line of photographic accessories. Here's what Mr. E. G. De Witt, Graflex Finishing Superintendent, has to say—"When we bought our 'Little Steve', we didn't know that we were buying such a versatile piece of equipment. It has been operating for six months and now we find that we got more than we expected. We can handle *all* of our decorative chrome work on the machine, even screws and other small parts in *baskets*. We are not paying for this versatility thru poorer quality either. Our quality has improved and our control is uniform."

On bright parts of the Graflex cameras, the "Little Steve" is plating copper-nickel-chrome, but it is equally adaptable to hard chrome, cadmium, tin, anodizing, bright dipping and all types of immersion processing.

Keep these things in mind. "Little Steve" requires a low capital investment. It is extremely versatile. It will give you high production — improved plating quality and reduce costs.

Investigate the possibilities "Little Steve" offers today. Write for illustrative literature.

***Remember*—When you go *automatic* . . . go STEVENS!**

frederic b. **STEVENS,** inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND
DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)

Fig. 1. An air view of General Electric's Appliance Park. To the rear of the six manufacturing buildings is the central warehouse (right center). Conveyors to the warehouse can be seen leading from the rear of all six buildings.

FINISHING SATIN CHROME BUILT-IN OVENS

by **STANLEY J. BEYER***

Flat polishing of thin gauge steel, use of bipolar and auxiliary anodes for plating, and automatic satin finishing are some of latest finishing techniques finding practical application in the appliance industry.

INTRODUCTION

BACK IN 1952 on a 1000 acre site just outside of Louisville, Kentucky, the General Electric Company completed the largest, most modern grouping of manufacturing buildings in the world for the manufacture of major household appliances (Fig. 1). In 1955, the custom built-in oven, finished in co'ored porcelain enamel and satin chrome (Fig. 2), was introduced. During this greatest home building year in the country's history, the built-in oven rapidly increased in popularity. By 1956, it was apparent that a completely new finishing system would be needed in the range plant for plating and satin finishing the components of the built-in oven. Fig. 3 shows the configuration of the most difficult piece, the front panel, around which many features of the new finishing system were designed.

Appearance design engineers insisted that the one-piece oven front panel design with its deep recesses for the instrument panel and the oven door was required to maintain industry leadership. So it was necessary for finish planners to include several advanced electroplating and polishing techniques in their layout of the new finishing system in order that finishing costs on these parts would not be prohibitive.

BASIC OPERATIONS

The following operations are performed to complete the door panel and the front panel:

1) Flat polish steel blanks on abrasive belt polishing machines to remove surface imperfections and to create an underlying scratch pattern, 2) Clean, dry and inspect, 3) Roller level immediately before forming parts, 4) Fabricate parts, 5) Limited polishing to remove die scores, strain lines, and other surface imperfections (front panel only), 6) Nickel plate, 7) Satin finish, 8) Chrome plate and inspect.

FLAT POLISHING

Pre-cut blanks, 23 by 28.25 by 0.030 in. for the door panel and 37.625 by 31.625 by 0.042 in. for the front panel, are fed into a roller leveling machine to straighten any bent edges. The blanks from the roller leveler feed directly onto the belt feed of the abrasive belt flat polishing machine (Fig. 4). For satin finished work, an extra fine finish is not desired. A single pass under three heads using No. 100 grit aluminum oxide abrasive belts, 36 and 42 in. wide for door panel and front panel blanks respectively, eliminates the majority of surface defects. Those blanks containing severe surface defects on one side can often be used by polishing the reverse side. As the blanks exit from the flat polisher, they feed directly into a washer. Traveling on a disc conveyor, they are brushed and sprayed with hot alkaline solution, followed with a hot water rinse, and then on through a drying oven. The blanks, leaving the dryer, are carefully inspected for surface imperfections as they are stacked.

Additional roller leveling is performed on the blanks immediately prior to fabricating the parts. This step reduces strain lines and eliminates tearing otherwise encountered in deep drawing. The door panels are formed in four operations on four straight side presses. (One 300-ton and three 100-ton presses.) Fabrication of the front panels is done on seven 250- and 300-ton straight-side presses in seven operations using oil-type drawing compound (Fig. 5). In addition, various brackets are spot welded to the panels. The

*Chemical Engineer, Organic Systems Laboratory, General Electric Company, Major Appliance Laboratories, Appliance Park, Louisville, Kentucky.

Fig. 2. Built-in oven finished in satin chrome.

Fig. 3. The built-in oven front panel in satin chrome Note the 1.5 in. deep recesses in the oven door opening (center) and in the instrument panel opening (top.) Panel is 32 in. high, 26 in. wide and 1.5 in. thick.

parts are then washed, rust proofed and transferred to an overhead storage and transfer conveyor.

The formed door panels require no polishing other than the original blank polishing and go directly to automatic nickel-chrome plating. The more difficult front panels require limited hand operations to remove die scores, strain lines, spot welds, etc.

CLEANING AND NICKEL PLATING

The machine cycle and solution compositions used are the conventional electrocleaning and bright plating in general use throughout the industry. Bright nickel plating is required because only about one-half the capacity of the automatic plating machine is used for satin work; the remaining capacity being used to bright chromium plate parts for both the free-standing conventional type electric ranges and the custom line of built-in ranges.

The door panels present no difficult racking or nickel plating problems, but approximately one-third of these panels contain a window, and for these parts, the rack has an auxiliary anode for chromium plating of the window flange. The chromium plating is done later on the same plating rack. Front panels presented a problem of obtaining sufficient nickel deposition in six deeply recessed areas without using an excessive amount of time and metal. This problem was not anticipated in the original design of the equipment but was readily solved by the use of a special bipolar anode (Fig. 6). This bipolar anode is constructed of welded steel rod with threaded end connections for holding six replaceable nickel anode tips and a 10 by 10 in. nickel cathode collector plate. All steel surfaces are plastisol coated.

The bipolar anode is bolted to the plating rack with the large collector plate facing the regular anodes, thus providing a low resistance metallic path for current to travel to the six anode tips strategically located approximately 0.75 in. from the recessed corners of the work (cathode) surfaces. In this manner, the thickness of the nickel deposit in a recess is actually somewhat greater than the average thickness plated.

At an intermediate load/unload station following nickel plating, the nickel-plated panels are removed (as are the bipolar anodes shown in Fig. 6) and previously satin-finished panels are substituted on the same rack for subsequent chromium plating. The bipolar anodes are placed on a conveyor to go to the main load/unload station for the next cycle. From this same conveyor, auxiliary anodes (Fig. 7) are removed and placed on the front panel plating racks in the

Fig. 4. Door panel blanks are shown being fed into a roller leveler and entering an abrasive belt polishing machine.

Fig. 5. Front panel is shown being loaded into a press for trimming the edges.

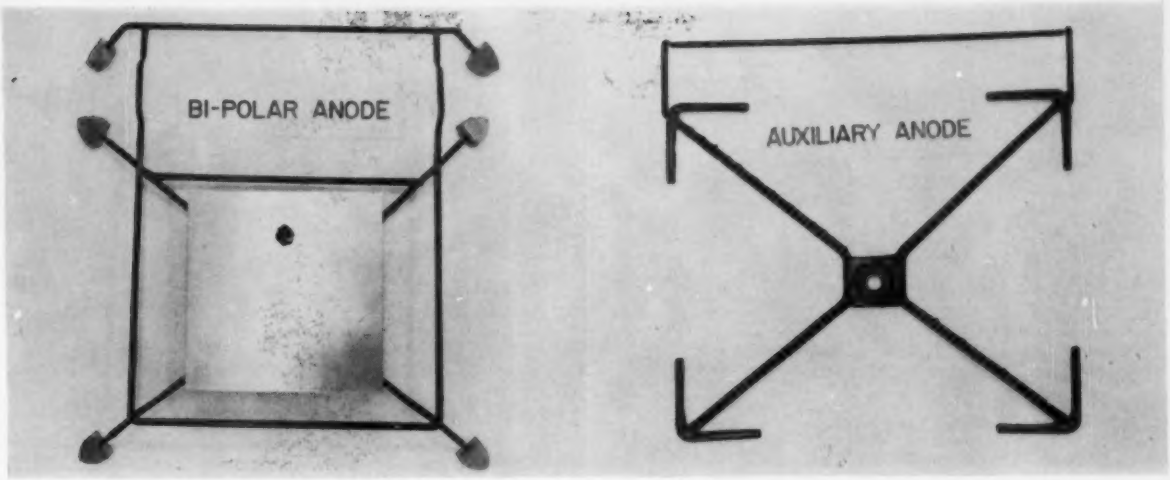


Fig. 6. Bipolar anode used to provide added nickel thickness in six critical recessed areas of the oven front panel. The six nickel anode tips and the 10 by 10 in. cathode collector plate are replaceable.

Fig. 7. Auxiliary anode for chromium plating the oven front panel. This anode provides the means of covering six recessed areas of the part with chromium where normally no chromium will deposit. Anode contact is made at the center hole when the auxiliary anode is bolted in place.

same position previously occupied by the bipolar anode for nickel plating. The rack thus loaded is ready for cleaning and chromium plating. When these anodes and racks were new, they were interchangeable, but later it was found desirable to identify each rack and corresponding anode to maintain a close fit between part and anode. Incidentally, an overhead conveyor which dips down next to the main load station is used to store plating racks not in use. This method has proved to be an invaluable solution to the plating rack storage problem.

SATIN FINISHING

Following nickel plating, the door panels are loaded on an automatic polishing machine (Fig. 8). Three conventional adjustable heads finish the three edges (bottom edge does not require finishing) and a special 24-in. reciprocating spring suspended head is used to satin finish the front surface in a single pass. The conveyor travels at five feet per minute. The large head rotates at 500 rpm (variable speed control to adjust for buff wear) using a contoured air-flow type buff reciprocating at 32 cycles per minute with a 2 in. amplitude.

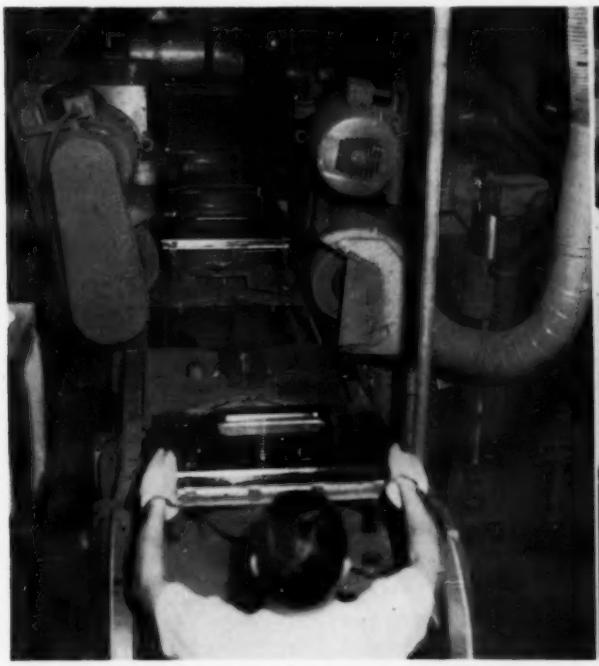


Fig. 8. Door panels being loaded on straight line automatic polishing machine for satin finishing the nickel plate. Three edges and the front surface are satin finished. The panels return underneath.

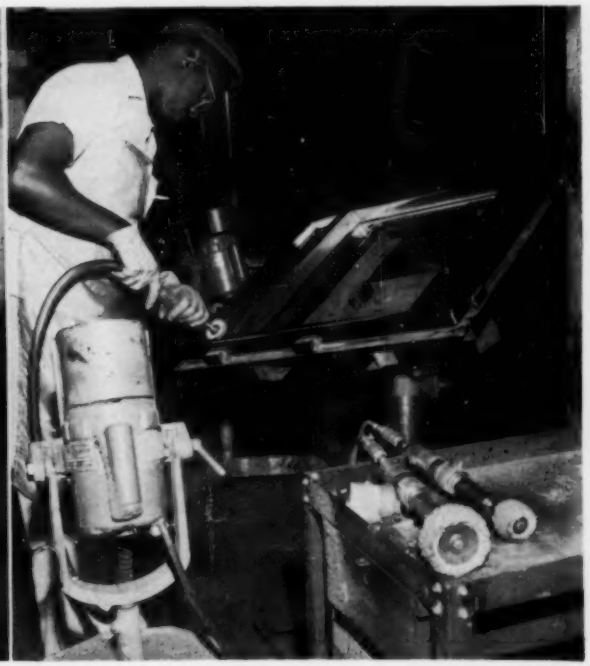


Fig. 9. Hand finishing the instrument recess of the oven front panel using portable tools.

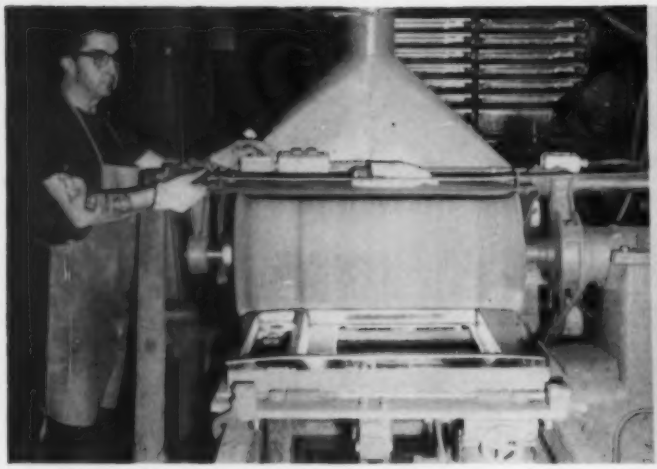


Fig. 10. Front surface of the front panel being processed using 36 in. wide wheel.

Fig. 11. Removing the auxiliary anodes before unloading the finished front panel. Note the center post (between operator's hands) to which the auxiliary anode is bolted. Plastisol coated flexible anode cables lead vertically from the center post connection to the auxiliary circuit contact (contact not shown in picture).

No. 80 grit greaseless compound is used by heading the wheels by hand using bar compound. Although some of the newer liquid silicate materials provide a satin finish with some operational advantages, none was capable of producing the soft, even satin finish desired by the quality control engineers. Various buff and compound combinations were tried, each producing its own characteristic appearance. Once the final appearance standards were established, it was not possible to duplicate that exact appearance except by retaining the exact buff and compound specifications. The oven front panels with their deep recesses presented finishing problems of greater magnitude, which could only be solved by resorting to a combination of hand finishing and semi-automatic operation. With the major polishing already done before forming, the task was greatly reduced. The instrument panel recess is satin finished using portable electric and air tools applied to the work on a special stand. The stand readily positions the work to allow easy access of the abrasive wheel to any surface (Fig. 9). Positioning is accomplished with foot pedal control of two air cylinders—one cylinder controls horizontal to vertical motion and a second cylinder controls rotation.

The edges of the front panel are finished by hand on a conventional buffing lathe and the front surface is finished in a single-pass semi-automatic operation using similar conveyor speed, reciprocation, buffs and compounds to that used on door panels to match the appearance on the door panel (Fig. 10).

CLEANING AND CHROMIUM PLATING

As previously described, the satin-finished panels are substituted at the intermediate load/unload station for freshly nickel-plated panels. The door panel racks already have auxiliary anodes for the window flange (no electrical connection was made on the auxiliary circuit during nickel plating). Front panels are fitted with separate auxiliary anodes and the loaded racks are conveyed through a cathodic alkaline electrocleaner, rinse, a combination electrolytic and chemical acid nickel activator, rinse and chromium plate. The nickel activation takes place in 8 per cent sulfuric acid solution containing 0.45 oz/gal of a proprietary chemical activator with potassium iodide as the basic activating ingredient. A potential of approximately 2.75 volts is used to supply 5–10 amperes per square foot. In the chromium plating tank, a spring loaded carrier shoe makes electrical contact with a slide bar which supplies a controlled current to the auxiliary anode circuit on the rack. Fig. 11 illustrates the relative positions of the auxiliary anode and the work. Note the center post (between the operator's hands) which acts to position the auxiliary anode and supply the controlled current required to cause deposition of chromium in the recessed corners. Plastisol coated flexible anode cables lead vertically from the center anode post connection to the auxiliary circuit contact (contact does not show in the picture). The plating solution used is a proprietary formulation containing sulfate and fluoride catalysts.

At the main load/unload station, the front panel auxiliary anodes are removed first (Fig. 11) and placed on the anode conveyor to be loaded at the intermediate load/unload station. Next the parts are removed from the plating rack and the parts thus completed are given a final careful inspection before they are assembled.

Stanley Beyer was born in Plainfield, New Jersey in 1921. He graduated from the University of Michigan in 1942 with a BSE degree in chemical engineering. He began his career as a process engineer for the Curtiss-Wright Corporation and after the War he worked for the Buffalo Plating Company, job electroplaters, in Buffalo, New York. He joined General Electric in 1951, working first as a manufacturing process planner, later as a foreman of plating and painting, then process planner in an Advanced Manufacturing Development section followed by a special assignment as an electroplating specialist and is presently a chemical engineer in the Organic Systems Laboratory of the Major Appliance Laboratories. After joining AES in Buffalo, he was instrumental in forming the Louisville Branch, has served in all of its executive offices and is presently Branch president.

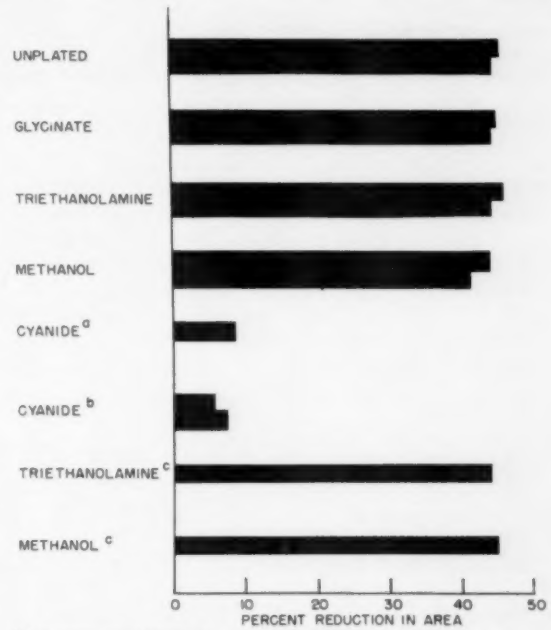
PROGRESS IN THE DEVELOPMENT OF A NONEMBRITTLING CADMIUM ELECTROPLATING PROCESS

FIRST IN A SERIES OF PAPERS

by P. N. VLANNES, S. W. STRAUSS and B. F. BROWN*

ELECTRODEPOSITION OF CADMIUM from the conventional cyanide bath embrittles high-strength steel because of the codeposition of hydrogen. This embrittlement may manifest itself as the slow fracture of a plated article maintained under stress; hence one method for assessing embrittlement employs a specimen maintained under stress for a prolonged period of time. The reported parameter is the time required for fracture. Since this fracture may occur after hundreds or even thousands of hours, a quicker test is desirable, at least for developmental stages of research programs. Accordingly, two tests have been devised which, though less sensitive than a delayed-fracture test, have the advantage of providing quick results which afford a measure of relative embrittlement from the more embrittling electroplating processes. One of these makes use of a wire which is bent around a mandril, usually at constant rate; the reported measurement is the angle of bend at which fracture occurs.[1] The second of these quick tests employs a specimen resembling the conventional rotating cantilever fatigue specimen; this specimen, however, is tested by pulling to fracture in a tensile machine.[2] The reported parameter is the reduction of area. This second method was adopted for these studies.

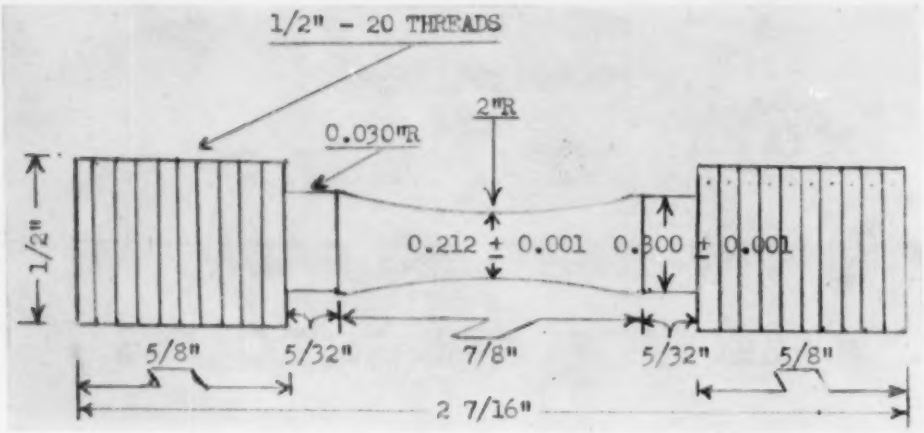
The test section of the specimens was 2 in. in length and had a surface of revolution of 2 in. radius, with the minimum specimen diameter being 0.212 in. The specimens, prepared from aircraft-quality 4340 steel heat treated to 285,000-300,000 psi, were cadmium plated to a thickness of about 0.0007 in. from: (a) an ammoniacal cadmium sulfate solution containing the ammonium salt of glycine, (b) a methanol solution of cadmium acetate, (c) an aqueous tri-ethanolamine-cadmium sulfate solution, and (d) the standard cyanide bath. Table I gives the compositions of the plating solutions and the current densities used. Some of the specimens plated from the methanol and from the triethanolamine solutions were overplated with cadmium from the cyanide bath to an additional thickness of 0.0005 in. In addition, specimens were plated from the cyanide bath to a thickness of 0.000125 in., heat treated for three hours at 300F, and again plated from the cyanide bath to a total thickness of 0.0007 in. Fig. 1



(a) PLATED TO 0.0007-IN. - NOT BAKED
(b) PLATED TO 0.000125-IN., BAKED AT 300° F FOR THREE HOURS, AND PLATED TO A TOTAL THICKNESS OF 0.0007-IN.
(c) OVERPLATED WITH CADMIUM FROM THE STANDARD CYANIDE BATH.
NOTE: DOUBLE BARS INDICATE TWO TEST SPECIMENS

FIG. 1. PERCENTAGE REDUCTION IN AREA OF SPECIMENS CADMIUM-PLATED FROM VARIOUS BATHS.

*Chemical Metallurgy Section, Physical Metallurgy Branch, Metallurgy Division, U. S. Naval Research Laboratory, Washington, D. C.



TENSILE SPECIMEN

gives values for the reduction in area of the plated specimens after test. It may be seen that in the preliminary assessment of the embrittlement characteristics of these baths, the results indicate that the glycinate, methanol and triethanolamine solutions are far less embrittling than the cyanide bath and therefore warrant further investigation.

REFERENCES

[1]Zapffe, C. A., and M. E. Haslem, Trans. Am. Soc. Metals **39,** 241 (1947).

[2]Johnson, H. H., E. J. Schneider, and A. R. Troiano, Iron Age **182,** No. 5, 47 (1958).

TABLE I

BATH COMPOSITION AND CURRENT DENSITIES

Plating Bath	Temp. (°C)	Current Density (Amp/sq ft)
1. **Glycinate***	25	15
Glycine 170 g		
$3CdSO_4.8H_2O$ 256 g		
Conc. NH_4OH 500 ml		
2. **Methanol**	0	15
Methyl Alcohol 1000 ml		
$Cd(CH_3COO)_2.2H_2O$ 240 g		
3. **Triethanolamine***	25	25
Triethanolamine 200 ml		
$3CdSO_4.8H_2O$ 256 g		
4. **Standard Cyanide**	25	25
CdO 3.5 oz per gal		
NaCN 17.0 oz per gal		
Brightener† 12 oz per gal		

* Diluted with water to 1 liter.
† R. O. Hull Company, "ROHCO 20-XL".

P. N. Vlannes is a chemist with the Chemical Metallurgy Section, Physical Metallurgy Branch, U. S. Naval Research Laboratory, Washington 25, D. C. He formerly held a research position with Department of the Interior, Bureau of Mines. Mr. Vlannes received his BS degree in chemistry from Centenary College of Louisiana and MS at Xavier University, Cincinnati, Ohio.

S. W. Strauss is presently Head, Chemical Metallurgy Section of the Physical Metallurgy Branch, U. S. Naval Research Laboratory. He held research positions at the National Bureau of Standards and at the Polytechnic Institute of Brooklyn. He received his BS, MS and PhD degrees in chemistry from the Polytechnic Institute of Brooklyn.

B. F. Brown is Head, Physical Metallurgy Branch, U. S. Naval Research Laboratory, Washington, D. C. He formerly held research posts at North Carolina State College, Massachusetts Institute of Technology and Carnegie Institute of Technology. His degrees in metallurgy were received from Carnegie Institute of Technology (DSc and MS) and the University of Kentucky where he was awarded the BS.

THE CORROSION RESISTANCE OF AND AN EVALUATING METHOD FOR VARIOUS ELECTRODEPOSITS ON STEEL

by DR. HEINZ W. DETTNER*

I. RESEARCH OBJECTIVE

Recently in German industry, especially the radio industry, the use of electroplated zinc deposits has been abandoned in many cases in favor of tin deposits. The reason for this change is the assertion, made by some electroplating supply houses, that the corrosion resistance of relatively thin flow-brightened tin deposits (e.g. 5 microns (0.2 mil) thick) is better than the corrosion resistance of essentially thicker zinc deposits (e.g. 10 microns (0.4 mil) thick). Moreover, tin deposits compared to zinc deposits have the advantage of being more easily solderable. Since there were only a few particular references in the literature[1]—which did not provide sufficiently complete data—and no comprehensive experiences in practice, a large scale investigation was performed to find out the corrosion properties of tin and zinc coatings. A similar investigation of E. E. Halls[1] furnished no numerical data as described later in his paper. To complete the image, cadmium and tin-zinc alloy coatings were tested in the course of this investigation.

II. TESTING PROCEDURE

The determination of the corrosion resistance was conducted by both accelerated corrosion tests and outdoor exposure tests. For the accelerated tests the Neutral Salt Spray Test, the "Tropical" Humidity Test and the "Industrial Air" Sulfur Dioxide-Carbon Dioxide Test were employed.

The Neutral Salt Spray Test was conducted with a three per cent NaCl (cp) solution. The test samples were placed in the test cabinet at a temperature of 20C (68F). From hour-to-hour 30 ml of the salt solution for each cubic meter volume were sprayed for one minute by compressed air. It should be noted that the salt spray test is performed in Germany as a cycle test, contrary to the USA continuous spraying technique.

In the "Tropical" Humidity Test the test panels were stationed in the Humidity Test Cabinet, where a relative humidity of 100 per cent at 40C (104F) was maintained for 8 hours and standard climate conditions during the remaining 16 hours, i.e. a temperature of 20C (68F) and a humidity of 65 per cent.

The "Industrial Air" Sulfur Dioxide-Carbon Dioxide Test was carried out in the same way as the Humidity Test, except that at the beginning of the 8-hour period a mixture of 0.8 per cent wt. SO_2 and 0.8 per cent wt CO_2 in air was introduced. This was also performed as a cycle test.

The test panels for the outdoor exposure test were exposed on the roof of a research institute in the urban atmosphere of Berlin. In order to render it possible in further investigations to compare the results of this outdoor exposure test, the climate conditions of the time of investigation are compiled in Table I. The evaluation of all of these investigations was performed by visual observation of the test panels at periodic intervals. The first visible change, i.e. the appearance of a tarnish film or white or red rust, was registered and recorded. The appearance of the test panels at the end or at the break of the investigation was also recorded. The data thus obtained served as bases for the evaluation.

III. MATERIALS

The low carbon panels, on which the coatings were deposited, were 70 by 70 mm (2.7 by 2.7 in.) in size, some 45 by 45 mm (1.8 x 1.8 in.) in size. In the upper part, a hole was drilled for jigging. The test panels were prepared for plating by vapor degreasing and electrolytic alkaline cleaning.

The coatings to be examined were:

1) Zinc, deposited from two different proprietary cyanide zinc solutions.* The control limits of these zinc baths were: A) Zn 28–35 g/l, NaCN (total) 85–110 g/l, NaOH 75–95 g/l, NaCN/Zn = 2.9–3.2; B) Zn 43–50 g/l, NaCN (total) 125–145 g/l, NaOH 125–145 g/l, NaCN/Zn = 2.7–2.9. Some of the deposits were employed matte, some were used bright by addition of brighteners (partly sulfur-containing) to the matte solution. Some of the matte and bright zinc deposits were chromated five seconds in a one-dip chromate base conversion solution at room temperature.
2) Cadmium, deposited from a proprietary cyanide solution. The control limits of this cadmium bath were: Cd 10–20 g/l, NaCN (total) 55–100 g/l, NaOH 5–20 g/l. This deposit was employed bright and unchromated.
3) Tin, deposited from proprietary acid and alkaline solutions. Control limits for the acid bath were: Sn 20–30 g/l, free cresol sulfonic acid (calculated as H_2SO_4) 60–80 g/l. Limits for the alkaline bath were: Sn 25–40 g/l, NaOH (free) 5–10 g/l. Since tin coatings can not be deposited bright until now for practical purposes, these matte deposits were brightened by re-flowing in an oil bath at 250C (500F) and degreased.

* Scientific Adviser, Electroplating Department, Schering, A. G., Berlin, Germany.

* "Brillant W" and "Neorapid W" of Schering A. G., Berlin, Germany.

TABLE I

WEATHER DURING THE OUTDOOR EXPOSURE TEST

(August 1957 through July 1958)

Month	Temperature max	Temperature min	Temperature average	Deviation (60 years)	Precipitations mm	Relat. humidity	Sunshine Days Clear	Sunshine Days Overcast	Sunshine Duration hr	Number of cloudy
August 1957	26.9	6.5	15.9	−1.5	60.0	80	0	7	178.6	6.3
September 1957	26.4	1.0	11.8	−2.0	73.5	85	1	11	136.0	6.8
October 1957	19.0	− 1.4	10.0	+1.3	22.8	85	1	14	99.7	6.9
November 1957	14.4	− 3.3	5.3	+1.5	18.9	83	1	20	46.2	8.0
December 1957	9.7	−14.2	0.6	−0.1	46.3	87	1	18	36.1	8.0
January 1958	6.0	−11.8	− 0.4	+0.3	36.0	83	6	14	87.7	6.3
February 1958	15.3	−10.6	+ 2.1	+1.8	68.1	82	1	22	85.7	6.5
March 1958	9.7	− 9.4	+ 0.5	−3.1	9.3	77	1	12	91.8	7.6
April 1958	18.2	− 4.1	5.9	−2.2	45.2	74	1	14	128.8	7.4
May 1958	30.0	+ 1.8	14.5	+1.1	87.7	73	0	21	190.3	6.9
June 1958	28.0	6.4	15.5	−1.0	74.5	75	0	17	190.4	6.8
July 1958	32.2	6.3	18.3	±0.0	67.9	76	2	19	254.3	5.9

4) Tin-zinc alloy (75 per cent Sn), deposited from the stannate-cyanide bath. Control limits were: Sn 25–30 g/l, Zn 3–4 g/l, KCN 22–28 g/l, KOH 4–7 g/l. The deposits were matte and not chromated.

For each test condition, two equal test panels were manufactured. Because three different deposit thicknesses and partly different proprietary baths were employed, two test panels seemed sufficient. The second panel received two handmade cross-wise scratches. Each set of test panels was made in thicknesses of 2.5 μ (0.1 mil), 5 μ (0.2 mil) and 10 μ (0.4 mil). The flow-brightened tin deposits could be manufactured only in a thickness of 5 μ (0.2 mil), due to the fact that uneven deposits will be obtained ("tears") if other thicknesses are employed.

Some of the tin coatings were deposited on an intermediate layer of copper or nickel to investigate the influence of this intermediate layer. The total thickness of these combined deposits was 7 μ (0.28 mil).

IV. EVALUATION

For evaluation of atmospheric exposure corrosion tests, it was necessary to relate the corrosion resistance to a definite measuring unit, yet there is no overall measuring unit for corrosion resistance (except perhaps the not always practicable loss of weight or thickness of a metal per unit of surface and time). Some researchers use the first indication of tarnish, of red rust or other corrosion products, others the weight change or the percentage of rust surface after a definite time of exposure to the artificial or natural climate as standard for atmospheric corrosion resistance. It was realized, of course, that the results of this investigation would vary with the use of different measuring units. If the corrosion rates of the coatings vary, it is obvious that different results would be obtained, depending on the kind of measuring unit used for evaluating corrosion resistance of the deposits. This is of course particularly the case if deposits of anodic and cathodic protection are compared jointly, e.g. zinc and tin. Many contradictory statements in the literature and practice are probably due to the use of different measuring units.

Most kinds of measuring units were used (cf Uhlig: Corrosion Handbook, pp. 805–815). in this investigation to obtain a more comprehensive picture of corrosion behavior of the deposits under examination—the first change of appearance (tarnish), the time till the first indication of red rust or other corrosion effects, and the percentage of rust area after conclusion of the test. The weight change of test panels was not included in this investigation because of the difficulties encountered in taking the panel out of the test cabinet, rinsing and drying without loss of particles of the corroded surface.

Regarding the point of time for measuring the percentage of rust area of the panels, it would be best to record the percentage of rust surface as frequently as possible. However, as a great quantity of quite similar figures is cumbersome and difficult to record, especially in this comprehensive test, only the rust surface after conclusion of the test was estimated and recorded. The accelerated tests were concluded in the three-month range (1656–1800 hr), outdoor exposure tests in approximately one year. For the very corrosive Carbon Dioxide Sulfur Dioxide Test, this period of time is somewhat too long. Most of the test panels therefore were rust coated after conclusion of this test.

The final appearance of the essential test panels after conclusion of the tests is shown in Figs. 1 to 4. However, it is not possible in all cases to draw exact conclusions from these photos because in the black and white photos the blackening does not always faithfully reproduce a poor behavior of the test panels.

Obtained experimental data are summarized in Tables II to V, which contain only the results of the 10 μ (0.4 mil) test panels. To save space, deposits with thicknesses of 2.5 μ (0.1 mil) and 5 μ (0.2 mil) were not specified in this table. The flow-brightened tin coatings—as mentioned above—could only be manufactured in a thickness of 5 μ (0.2 mil) plus an intermediate layer of copper or nickel with an additional thickness of 2 μ (0.08 mil).

An evaluating scheme for numerical data was developed using the estimated rust area of the test panels after conclusion of the various tests as an indication of the degree of corrosion resistance. The mean rust surface value of the 2-,

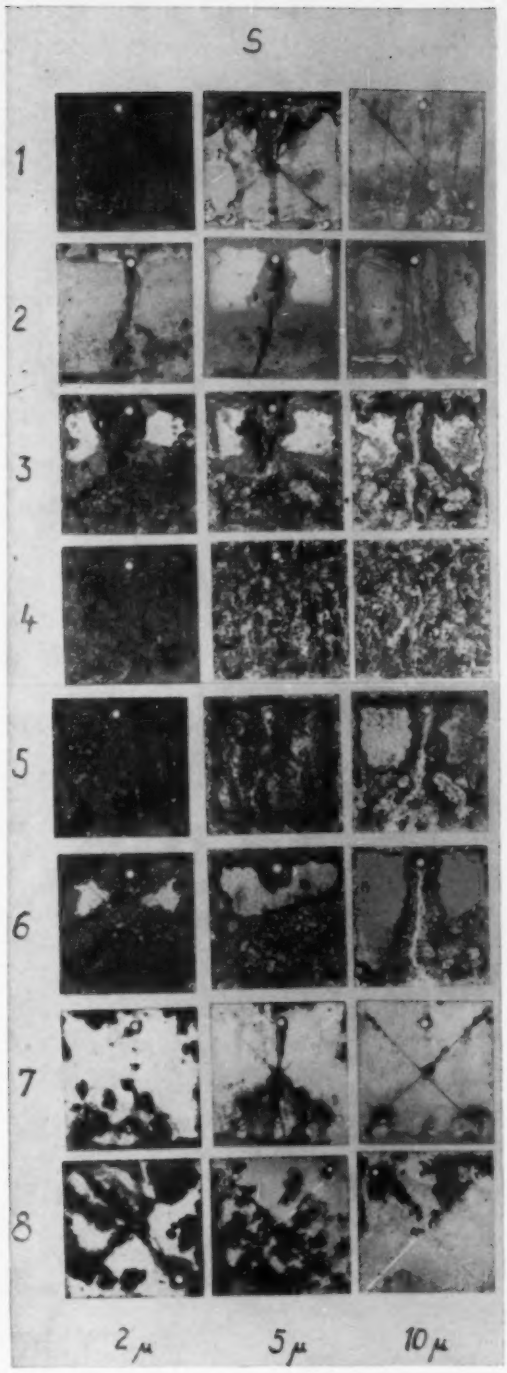


Fig. 1. Panels after 1800 hours salt spray test. 1:3.5.

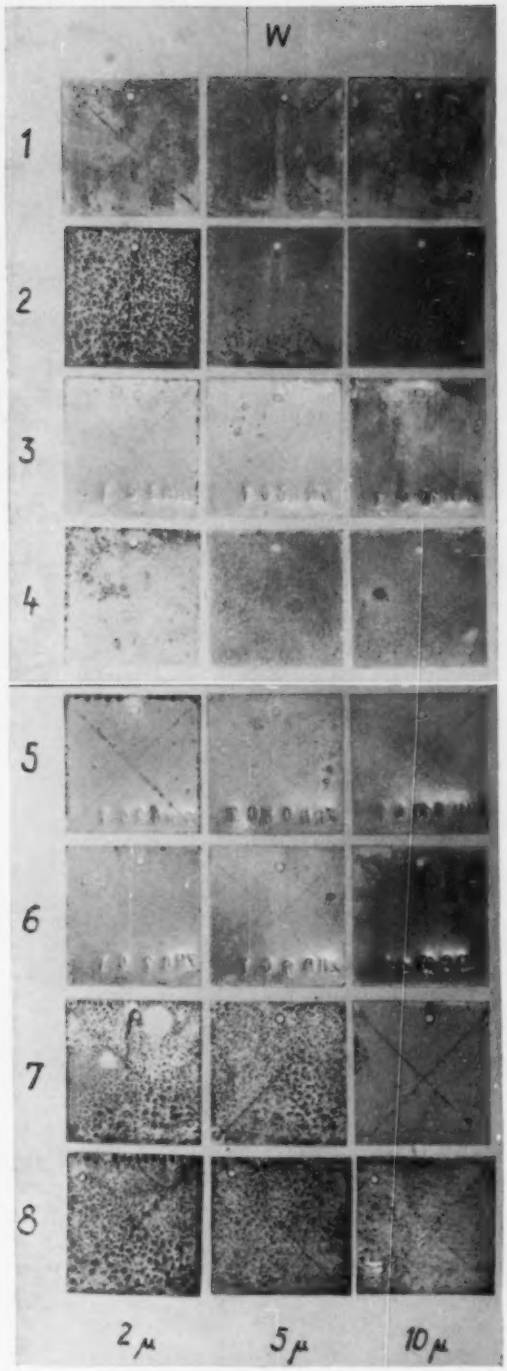


Fig. 2. Panels after 1776 hours humidity test. 1:3.5.

IN ALL OF THE FIGURES, THE NUMBERS 1 to 8 DENOTE THE FOLLOWING:

1. Cadmium deposit, bright, from proprietary "Trisalyt"-bath, not chromated.

2. Tin-zinc-alloy deposit, matte, not chromated.

3. Zinc deposit, bright, from proprietary "Neorapid"-bath, not chromated.

4. Zinc deposit, matte, from proprietary "Neorapid"-bath, not chromated.

5. Zinc deposit, matte, from proprietary "Neorapid"-bath, chromated.

6. Zinc deposit, bright, from proprietary "Brilliant"-bath, chromated.

7. Tin deposit, from acid "GT"-bath, not flow-brightened.

8. Tin deposit, from alkaline bath, not flow-brightened.

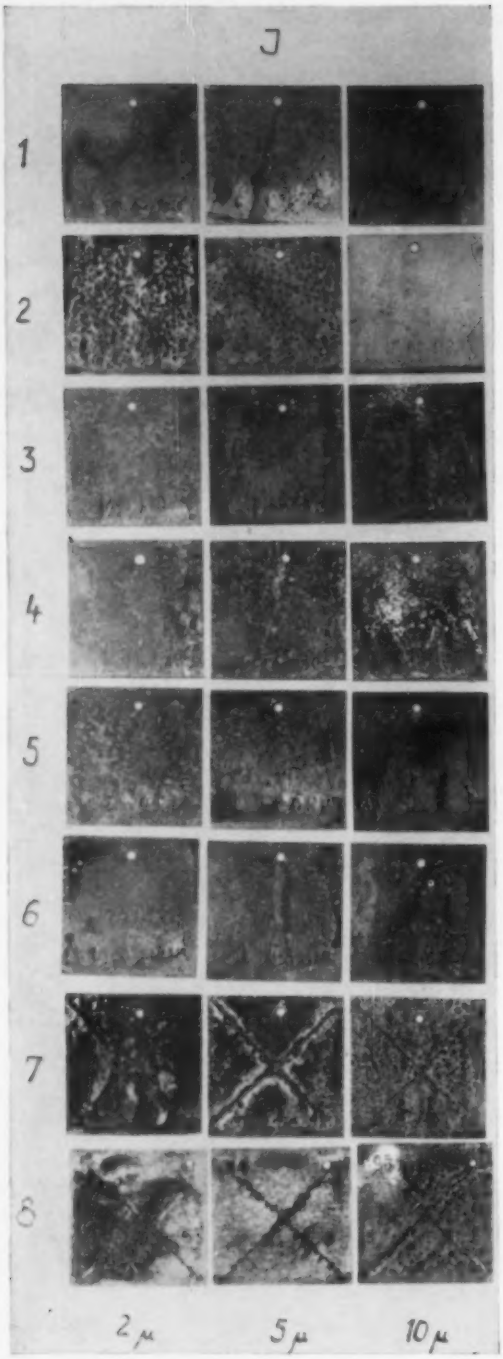


Fig. 3. Panels after 1656 hours "industrial air" (SO_2-CO_2)-test. 1:3.5.

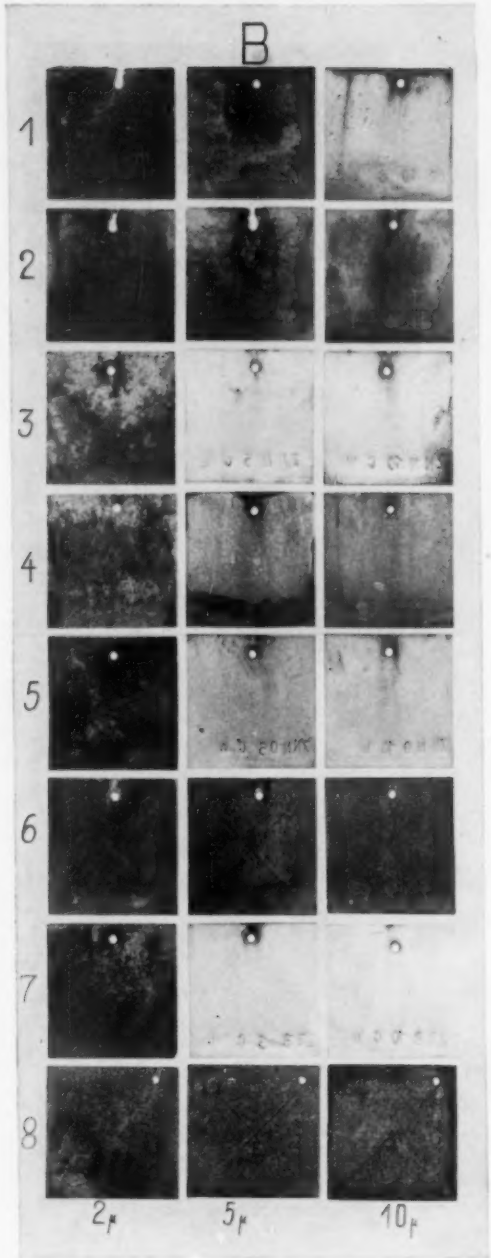


Fig. 4. Panels after 8280 hours (=ca. 1 year) outdoor weathering. 1:3.5.

5- and 10-μ test panels (average value of two or more test panels) in per cent of Tables II to V is summarized in Tables VI to IX. An "overall rust surface value" was found by adding the 2-, 5- and 10-μ values and dividing by three. As would be expected this value is somewhat above the 5-μ value ($\frac{2+5+10}{3} = 5.7$). This gives a better comparison to the value for the flow-brightened tin deposits with intermediate layer, which were manufactured only in a coating thickness of $5 + 2\ \mu$. However, the usefulness of the "overall rust surface value" is somewhat critical in the light of the varying behavior of deposits of different thicknesses, as stated in the next section (V. Results).

It is realized that this evaluating method is open to criticism but it should be recognized as an auxiliary means to obtain numerical data. Its disadvantage is in the fact that the presented data depend on estimated values for rust area of the test panels and that the tables contain no statement on the temporal run of the corrosion and its kind. Moreover for some industries, the beginning and degree of tarnishing

TABLE II
NEUTRAL SALT SPRAY TEST
(mean values)—coating thickness: 10 microns (0.4 mil), flow-brightened tin deposits 5 and 7 microns (0.2 and 0.3 mil)

Designation of the test panel	Type of deposit	First alteration of the deposit		First indication of corrosion effects except red rust		First indication of red rust		Termination of the test (hr)	Degree of rusting percentage (estimated)
		Time (hr)	Type	Time (hr)	Type	Time (hr)	Type		
ZN NO 10 BS	matte zinc (proprietary "Neorapid bath), not chromated	24	covered with a brown film	120	gray corrosion products	624/912	rust at the upper part	1800	50
ZN NO 10 CS	matte zinc (prop "Neorapid" bath), chromated	96	gray spots, mainly at the upper edges	120	gray corrosion products at the edges	624/912	rust at the edges	1800	15
ZN N 10 CS	bright zinc (prop "Neorapid" bath), chromated	120	gray-matte spots, mainly at the edges have already gray corrosion products	168	gray corrosion products at the upper edges	1776	little rust	1800	15
ZN B 10 CS	bright zinc (prop "Brilliant) chromated	96	gray spots at the upper edge	120	gray corrosion products at the upper edge	1176	rusting starts at the edges	1800	5
SN 10 BS	tin from acid bath not flow-brightened	48	rust at the edges	—	—	48	rust at the edges	1800	10 (25 at crosswise scratches)
3 B/D	tin from alkaline bath not flow-brightened	52	rust at the edges	—	—	52	rust at the edges	1800	25–30 (70 at crosswise scratches)
SN F S	tin (5μ) from alkaline bath without intermediate layer, flow-brightened	48–52	rust at the edges	—	—	48–52	rust at the edges	1800	40–50 (100 at crosswise scratches)
SN F CU S	tin (5μ) from alkaline bath with intermediate layer (2μ) of copper, flow-brightened	52	rust at the edges	—	—	52	rust at the edges	1800	50–60 (100 at crosswise scratches)
SN F NI S	tin (5μ) from alkaline bath with intermediate layer (2μ) of nickel, flow-brightened	48	rust at the edges	—	—	48	rust at the edges	1800	25–50 (100 at crosswise scratches)
ZN SN 5 BS	tin-zinc, not chromated	72	dark colored	120	gray-white corrosion products	624	rust at the upper part	1800	4 (0 at crosswise scratches)
CD 10 BS	bright cadmium not chromated	120	gray-matte colored	168	gray corrosion products	696	—	1800	1–2 (0 at crosswise scratches)

is an important fact. Despite this, these rust area values are advantageous since they furnish numerical data which are easy to calculate. This is of prime importance to the practical plater who wants to know clearly which coating is best for him to use—though it might not be scientifically exact.

V. RESULTS

Experimental data are given in Tables II to V and of the rust areas after conclusion of the test in Tables VI to IX. They lead to the following:

The results indicate that the coating thickness may be an important fact in the evaluation of the corrosion resistance of plated coatings. Thin deposits sometimes exhibit a performance contrary to that of thick deposits, e.g., 2μ-cadmium deposits in Table VI show the highest degree of rusting due while 10 μ-cadmium deposits show lowest rusting compared to other deposits of the same thickness. Another important factor in the evaluation of corrosion tests of different deposits is that of the timing of the visual observation of the test panels. If the corrosion rate differs—as it does in the case of deposits, which exhibit anodic or cathodic protection (e.g. zinc and tin coatings)—one can obtain different results, according to the time of observation.

The details of this investigation indicate the following:

(1) General Results for the Four Test Conditions

Matte: bright zinc deposits

Matte and bright zinc deposits appear to have the same

TABLE III
HUMIDITY TEST
(mean values)—coating thickness: 10 microns (0.4 mil), flow-brightened tin deposits 5 and 7 microns (0.2 and 0.3 mil)

Designation of the test panel	Type of deposit	First alteration of the deposit		First indication of corrosion effects except red rust		First indication of red rust		Termination of the test (hr)	Degree of rusting percentage (estimated)
		Time (hr)	Type	Time (hr)	Type	Time (hr)	Type		
ZN NO 10 BT	matte zinc (proprietary "Neorapid" bath), not chromated	48	dark-gray colored	96	gray corrosion products	—	—	1776	0
ZN NO 10 CT	matte zinc (proprietary "Neorapid" bath) chromated	120	partly matte gray spots	168	gray corrosion products at the edges	—	—	1776	0
ZN N 10 CT	bright zinc (proprietary "Neorapid" bath) chromated	120	partly spots, especially at the edges	168	gray corrosion products at the edges	—	—	1776	0
ZN B 10 CT	bright zinc (proprietary "Brilliant bath), chromated	120	partly matte gray spots	168	gray corrosion products at the edges	—	—	1776	0
SN 10 BT	tin from acid bath, not flow-brightened	120	light-brown spots	—	—	1344	rust spots	1776	10–15 (70 at crosswise scratches)
3 E/G	tin from alkaline bath, not flow-brightened	20	rust spots at the edges	—	—	20	rust spots at the edges	1776	35–40 (60 at crosswise scratches)
SN F T	tin (5μ) from alkaline bath, without intermediate layer, flow-brightened	52–96	a few small rust spots, especially at the edges	—	—	52–96	a few small rust spots, especially at the edges	1776	20 (100 at crosswise scratches)
SN F CU T	tin (5μ) from alkaline bath, with intermediate layer (2μ) of copper, flow-brightened	52–120	a few small rust spots, especially at the edges	—	—	52–120	a few small rust spots, especially at the edges	1776	8–15 (100 at crosswise scratches)
SN F NI T	tin (5μ) from alkaline bath, with intermediate layer (2μ) of nickel, flow-brightened	52–360	some small rust spots at pores and cross-wise scratches	—	—	52–360	some small rust spots at pores and cross-wise scratches	1776	2 (100 at crosswise scratches)
ZN SN 10 BT	tin-zinc, not chromated	52	brown colored	120	gray corrosion products	1344	rust spots	1776	1–3 (up to 20 at the crosswise scratches)
CD 10 BT	bright cadmium not chromated	52	brown colored	—	—	360	rust spots at the cross-wise scratches	1776	50 (up to 75 at the crosswise scratches)

corrosion resistance. Only in the case of salt spray test, bright zinc plated panels exhibit a slightly smaller rust area after conclusion of the test, but on the other hand there may be an earlier rusting of the 2- and 5-μ test panels with the humidity test. This statement is conclusive only for the tested proprietary brighteners. It is a question whether other brighteners show the same performance.

Chromating

Chromate passivated zinc deposits within the experimental limits, were better—as expected—under every condition than coatings not chromated. This means that formation of tarnish layers and rusting of untreated zinc panels starts earlier and the rust area is larger after lapse of time. The exposure time to first rust indication was found to be prolonged approximately 1.25 to 1.55 times by application of chromate film. R. H. Wolff[4] reports that the time was doubled with 0.5 mil zinc deposits.

Flow-brightening of tin

The question whether flow-brightening offers a better corrosion resistance is not easy to answer. While flow-brightened tin deposit panels show a larger rust area after conclusion of the test than unbrightened tin coatings in salt spray testing, their behavior was better in the humidity and sulfur-dioxide-carbon-dioxide test. The first indication of rust was seen later on flow-brightened tinned panels. M. S. Frant[2] states that tin coatings with a low thickness perform

a better corrosion resistance when they are flow-brightened, but thick tin coatings show poorer behavior. However, K. Müller[3] claims a better performance of flow-brightened tin deposits of every thickness with the salt spray test. The first indication of rust in Muller's investigation was observed later than it was in this investigation.

Intermediate layers in tin plating

The influence of an intermediate layer on tin deposits was such that the corrosion resistance was increased when an intermediate layer was applied. This was not true of the final rust area of the intermediate copper layer with the salt spray test. The improvement of the corrosion resistance of a nickel layer was better than that of a copper layer, so that the behavior was improved in the sequence: without-, with copper-, with nickel intermediate layer. However, it should be remembered that the total thickness of the combined deposit was $5 + 2 = 7$ microns, i.e. 40 per cent greater than the 5-micron tin deposit without intermediate layers. But the improvement seems indeed to overcome the raise of the coating thickness.

Tin Deposits from the Acid and the Alkaline Bath

Comparing tin deposits from the acid and the alkaline bath, the coatings from the acid bath exhibit an unequivocally better performance. Only when observing the first indication of rust in the salt spray test was an equal, or even poorer, behavior noticed. Under all test conditions, the panel from the acid bath had a smaller rust area after conclusion of the test. The reason for the better corrosion resistance of tin deposits from the acid bath is unknown. Hydrogen embrittlement is less with the nearly 100 per cent current efficiency acid bath and leveling is perhaps better in the acid tin solution (this is only an assumption, no trials were made in this regard). M. S. Frant in his paper[2] observed a poorer behavior of the acid bath deposits but this may depend on the poorer throwing power of the acid bath in the recesses of the employed intricate articles.

(2) Special Observations with the Salt Spray Test

The percentage of rust area obtained after 1800 hours of salt spray testing is given in Table VI. Taking the overall percentage of rust area after 1800 hours as a means for evaluation of the corrosion resistance, the resistance increases from the No. 1 deposit (matte zinc, from N-bath, not chromated) having the largest rust area, in the sequence 2-6-10-4-3-11 up to the No. 5 deposit (not flow-brightened tin from acid bath) with the smallest rust area, if one does not take into consideration flow-brightened tin deposits, which could be manufactured only in a thickness of $5 + 2$ microns. Assuming that the percentage of rust area of the flow-brightened tin deposits is adequate to the mean value of the 5- and 10-μ zinc, cadmium and not flow-brightened tin deposits, the sequence of rusted area is 1 and 8 (largest rust area)—7-9-6-2-4-3-5-10 (smallest rust area). The distinction of the first sequence (i.e. the overall value) and the second sequence (i.e. the mean value between the 5- and 10-μ value) indicates the importance of coating thickness in the evaluation of the corrosion performance. Fig. 1 indicates the state of the test panels after conclusion of the salt spray test, after 1800 hours. Apart from this, registration of the rust area, the following observations were made:

Zn : Sn

Tin plated panels show earlier rusting than chromated zinc coatings of the same deposit thickness, because tin deposits offer no anodic protection as is the case with zinc deposits. It seems that the corrosion rate of zinc deposits is higher when corrosion has once started, compared to tin deposits.

Untreated zinc deposits, up to the thickness of 10 μ (0.4 mil), become tarnished and/or rusty-brown colored in approximately the same exposure time in which tinned panels—especially those not flow-brightened from the alkaline bath—start to rust at the edges. The appearance of a gray tarnish layer on zinc deposits takes place in a very early stage, while areas not rusted on the tin coating panels remain bright.

Zn : Cd

Cadmium coatings acted, in general, similar to zinc deposits as they also offered anodic protection. The performance of cadmium was somewhat better than zinc: untreated cadmium plated panels start to tarnish and rust approximately in the same time as the best chromated zinc plated panels. Also at the end of the salt spray test the rust area was smaller on cadmium than on untreated zinc and equal to chromated zinc panels. Cadmium deposits exhibited under salt spray test conditions a very strong influence of the deposits' thickness. While 2-μ cadmium plated panels are 100 per cent rust coated before conclusion of the test, the 5 μ are 15 per cent and the 10-μ panels only 1.5 per cent rust coated at the end of the test.

Zn : Sn-Zn, Sn : Sn-Zn

Tin-zinc alloy deposits were better in many respects than zinc deposits. The rust area after conclusion of the salt spray test was the smallest of all 5- and 10-μ panels. The first formation of rust and other corrosion products of tin-zinc coatings was between the behavior of the tin and the zinc: dark colored corrosion films as well as rust appear earlier than on chromated zinc plated panels but later than on tinned panels. The rust area after conclusion of the test was somewhat larger on the zinc and tin deposits from the alkaline bath, but less compared to the tin coatings from the acid bath except those with a thickness of 10 μ (5 μ equal).

Cd : Sn-Zn

Considering the tin-zinc alloy deposits in relation to cadmium coatings, the first-named panels show—at all thicknesses—an earlier tarnishing and rusting than cadmium plated panels. The rust area after conclusion of the test was very similar on panels with both deposits, but in the 2-μ range the cadmium panels exhibited a larger rust area at the end.

Cd : Sn

Tin: cadmium has a tendency toward the tin: zinc performance but, as expressed above, cadmium was generally somewhat better than zinc, except the 2 μ cadmium deposits.

(3) Special Observations with the Humidity Test

Table VII indicates the percentage of rust area after conclusion of the humidity test (1776 hr) employing this percentage as means for evaluating the test as in the salt spray test, the sequence of test panel rust area was 10- (bright cadmium, not chromated for best performance)-4-3-2-1-11-5-6 (alkaline tin for poorest performance) if one does not take into consideration the flow-brightened $5+2$ μ tin deposits and the mean value of the 5 and 10 μ other deposits (see (2) Salt Spray Test) the sequence is 10-4-1-3-2-11-9-8-5-7-6.

The appearance of the test panels after 1776-hour humidity test, exposure time is indicated in Fig. 2.

TABLE IV

SULFUR DIOXIDE-CARBON DIOXIDE TEST

(mean values)—coating thickness: 10 microns (0.4 mil), flow-brightened tin deposits 5 and 7 microns (0.2 and 0.3 mil)

Designation of the test panel	Type of deposit	First alteration of the deposit		First indication of corrosion effects except red rust		First indication of red rust		Termination of the test (hr)	Degree of rusting percentage (estimated)
		Time (hr)	Type	Time (hr)	Type	Time (hr)	Type		
ZN NO 10 BJ	matte zinc (proprietary "Neorapid" bath), not chromated	3	matte tarnished	8	gray corrosion products	696	rust at the upper edges	1152–1440	100
ZN NO 10 CJ	matte zinc (proprietary "Neorapid" bath), chromated	8	matte tarnished	48	gray corrosion products	696	rust at the upper edges	1152	98–100
ZN N 10 CJ	bright zinc (proprietary "Neorapid" bath), chromated	8	matte tarnished	48	gray corrosion products	696	rust at the upper edges	1152	100
ZN B 10 CJ	bright zinc (proprietary "Brilliant" bath), chromated	8	matte tarnished	48	gray corrosion products	696	rust at the upper edges	1032	100
SN 10 BJ	tin from acid bath, not flow-brightened	8	brown-spotty rust spots mainly at the edges and cross-wise scratches	—	—	8	brown-spotty, rust spots mainly at the edges and cross-wise scratches	1656	95 (100 at the cross-wise scratches)
3 A/C	tin from alkaline bath, not flow-brightened	8	brown-spotty, rust spots mainly at the edges and cross-wise scratches	—	—	8	brown-spotty, rust spots mainly at the edges and cross-wise scratches	1248–1440	90–100 (100 at the cross-wise scratches)
S N F J	tin (5μ) from alkaline bath, without intermediate layer, flow-brightened	8	rust spots, mainly at the edges and cross-wise scratches	—	—	8	rust spots, mainly at the edges and cross-wise scratches	1440–1656	95–100
SN F CU J	tin (5μ) from alkaline bath, with intermediate layer (2μ) of copper, flow-brightened	10	rust spots, mainly at the cross-wise scratches	—	—	10	rust spots, mainly at the cross-wise scratches	1656	90–95 (100 cross-wise scratches)
SN F NI J	tin (5μ) from alkaline bath, with intermediate layer (2μ) of nickel, flow-brightened	24	rust spots, mainly at the cross-wise scratches	—	—	24	rust spots, mainly at the cross-wise scratches	1656	40–50 (100 cross-wise scratches)
ZN SN 10 BJ	tin-zinc, not chromated	8	gray-matte colored, spotty	24	gray corrosion products	264	rusting starts at the edges	1656	15 (0 at cross-wise scratches)
CD 10 BJ	bright cadmium not chromated	6	gray-matte tarnished	576	gray-green corrosion products	576	rust at the upper edges	1440	100

Besides this the following observations were made:

Zn : Sn

Under Humidity Test conditions zinc was undoubtedly a better coating than tin. Only tin deposits from the acid bath and unscratched flow-brightened from the alkaline bath with intermediate layer later exhibited a formation of brown spots instead of the formation of gray tarnish (not rust) on non-chromated zinc coatings, but in all cases the rust area after conclusion of the test was larger on the tin deposit panels.

Zn : Cd

Cadmium shows even better performance than zinc. The final rust area was the smallest of all deposits in this test and rusting started later on cadmium plated panels, but on uncoated areas (scratched) rusting starts earlier due to the less anodic protection. The first tarnish on the (non-chromated) cadmium deposit appeared in about the same time as on untreated zinc coatings, but earlier than on chromated zinc deposits. Rust and other corrosion products form later on cadmium plated panels.

TABLE V

OUTDOOR EXPOSURE TEST

(mean values)—coating thickness: 10 microns (0.4 mil), flow-brightened tin deposits 5 and 2 microns (0.2 and 0.1 mil)

Designation of the test panel	Type of deposit	First alteration of the deposit		First indication of corrosion effects except red rust		First indication of red rust		Conclusion of the test (hr)	Degree of rusting percentage (estimated)
		Time (hr)	Type	Time (hr)	Type	Time (hr)	Type		
ZN NO 10 BW	matte zinc (proprietary "Neorapid" bath), not chromated	96	gray-dull spots	480	gray corrosion products	8280	slight rust at the lower edges	8280	1.5
ZN NO 10 CW	matte zinc (prop "Neorapid" bath), chromated	144	gray-dull spots	—	—	—	—	8280	0
ZN NO 10 CW	bright zinc (prop "Neorapid" bath), chromated	168	partly gray-matte spots	—	—	8280	little rust at the hole and the lower edges	8280	2
ZN B 10 CW	bright zinc (prop "Brilliant"), chromated	168	gray-dull spots	—	—	—	—	8280	0
SN 10 BW	tin from acid bath not flow-brightened	72	gray-dull spots	96	spots of gray corrosion products	120	rust spots especially at the cross-wise scratches	3672	100
3 F/H	tin from alkaline bath not flow-brightened	48	gray-dull spots	72	spots of gray corrosion products	120	rust spots	3336	100
SN F W	tin (5 μ) from alkaline bath without intermediate layer, flow-brightened	72	gray-dull spots	72	spots of gray corrosion products	120–144	rust spots especially at the cross-wise scratches	6864	98
SN F CU W	tin (5 μ) from alkaline bath with intermediate layer (2 μ) of copper flow-brightened	120	gray-dull spots	168	spots of gray corrosion products	168 792	rust at cross-wise scratches some little rust spots	8280	68 (100 at cross-wise scratches)
SN F NI W	tin (5 μ) from alkaline bath with intermediate layer (2 μ) of nickel flow-brightened	120	gray-dull spots	168	spots of gray corrosion products	168 792	rust at cross-wise scratches some little rust spots	8280	50 (100 at cross-wise scratches)
ZN SN 5 BW	tin-zinc, not chromated	120	gray-dull spots	—	—	5260	rusting starts at the edges	8280	50
CD 10 BW	bright cadmium not chromated	96	dull-spotty tarnished	—	—	8280	rust at the upper edge	8280	2

Zn : Sn-Zn, Sn : Sn-Sn

Tin-zinc alloy coatings under humidity test conditions exhibit about the performance for both tin and zinc: First formation of tarnish and rust corrosion begins as late as it does on unchromated zinc plated panels. The rust area after conclusion of the test is larger than on zinc plated panels but less than on those with tin deposits.

Sn-Zn : Cd

Comparison of the alloy deposits with cadmium coatings showed that the formation of the brownish color was the same on both. The first indication of rust was earlier on the alloy coating panels. The percentage of rust after conclusion of the test was also higher on the tin-zinc deposit panels, especially with the thinner 2-μ deposits.

Cd : Sn

Cadmium coatings compared with tin deposits exhibit in general a better performance. The rust area after conclusion of the test was even smaller than on zinc plated panels. Unchromated cadmium deposits tarnish within the same time as scratched flow-brightened tin deposits and later than non-flow-brightened tin coatings from the alkaline bath, but earlier than tin deposits from the acid bath.

(4) "Industrial Air"-Sulfur-Dioxide Carbon-Dioxide Test

Table IV shows the time to the first indication of rust and other corrosion products for 10-μ test panels. The percentage of rust area after conclusion of the test (1656 hr) is given in Table VIII. Since many of the test panels were 100 per cent

TABLE VI

PERCENTAGE OF RUST SURFACE OF ZINC, TIN, TIN-ZINC-ALLOY AND CADMIUM DEPOSITS AFTER 1800-HOUR SALT-SPRAY TEST

Number	Type of deposit	Thickness of the deposit (microns) 2	5	10	Overall value
1	zinc, matte, N-bath, not chromated	98	60	50	69.2
2	zinc, matte, N-bath, chromated	95	45	15	51.5
3	zinc, bright, N-bath, chromated	55	20	15	30
4	zinc, bright, B-bath, chromated	60	32.5	5	32.5
5	tin, acid bath, not flow-brightened	20	15	10	15
6	tin, alkaline bath, not flow-brightened	80	35	27.5	47.5
7	tin, alkaline bath, flow-brightened without intermediate layer		42.5		
8	tin, alkaline bath, flow-brightened with intermediate Cu-layer	(5 + 2 μ)	55		
9	tin, alkaline bath, flow-brightened with intermediate Ni-layer		37.5		
10	cadmium, bright, not chromated	100*	15	1.5	38.5
11	tin-zinc-alloy, matte not chromated	47.5	15	4	22.2

* 100 per cent rusting of the surface was already completed after 1320 and 1484 hours.

TABLE VII

PERCENTAGE OF RUST SURFACE OF ZINC, TIN, TIN-ZINC-ALLOY AND CADMIUM DEPOSITS AFTER 1776 HOURS HUMIDITY TEST

Number	Type of deposit	Thickness of deposit (microns) 2	5	10	Overall value
1	zinc, matte, N-bath, not chromated	17.5	0.5	0	6
2	zinc, matte, N-bath, chromated	2.5	1	0	1.2
3	zinc, bright, N-bath, chromated	2	1	0	1
4	zinc, bright, B-bath, chromated	2	0.3	0	0.7
5	tin, acid bath, not flow-brightened	60	50	12.5	40.3
6	tin, alkaline bath, not flow-brightened	60	50	37.5	49.1
7	tin, alkaline bath, flow-brightened, without intermediate layer (5μ)		37.5		
8	tin, alkaline bath, flow-brightened, with intermediate Cu-layer	(5 + 2 μ)	11.5		
9	tin, alkaline bath, flow-brightened, with intermediate Ni-layer		2		
10	cadmium, bright, not chromated	0.5	0	0	0.2
11	tin-zinc-alloy, matte, not chromated	50	2	0	17.3

TABLE VIII

PERCENTAGE OF RUST SURFACE OF ZINC, TIN, TIN-ZINC-ALLOY AND CADMIUM DEPOSITS AFTER 1656-HOUR SULFUR DIOXIDE-CARBON DIOXIDE TEST

The figures in parentheses indicate time for 100 per cent rusting

Number	Type of deposit	Thickness of deposit (microns) 2	5	10	Overall value
1	zinc, matte, N-bath, not chromated	100 (264)	100 (900)	100 (1772)	100
2	zinc, matte, N-bath, chromated	99 (264)	100 (792)	99 (1152)	100
3	zinc, bright, N-bath, chromated	95 (264)	100 (768)	100 (1152)	100
4	zinc, bright, B-bath, chromated	100 (576)	100 (828)	100 (1032)	100
5	tin, acid bath, not flow-brightened	100 (1142)	98 (1452)	95	98
6	tin, alkaline bath, not flow-brightened	90 (576)	95 (576)	95 (1344)	100
7	tin, alkaline bath, flow-brightened without intermediate layer (5μ)		98		
8	tin, alkaline bath, flow-brightened, with intermediate Cu-layer	(5 + 2 μ)	92.5		
9	tin, alkaline bath, flow-brightened, with intermediate Ni-layer		45		
10	cadmium, bright, not chromated	100 (264)	95 (576)	100 (1440)	100
11	tin-zinc-alloy, matte, not chromated	95	95	15	68.2

TABLE IX

PERCENTAGE OF RUST AREA OF ZINC, TIN, TIN-ZINC-ALLOY AND CADMIUM DEPOSITS AFTER 8280 HOURS (= CA. 1 YEAR) OUTDOOR WEATHERING

Number	Type of deposit	Thickness of the deposit (microns) 2	5	10	Overall value
1	zinc, matte, N-bath, not chromated	98	1	1	33.3
2	zinc, matte, N-bath, chromated	100	1	0	33.7
3	zinc, bright, N-bath, chromated	98	2	2	34
4	zinc, bright, B-bath, chromated	97.5	0.5	0	32.7
5	tin, acid bath, not flow-brightened	100 (456)	100 (816)	100 (3672)	100
6	tin, alkaline bath, not flow-brightened	100 (912)	100 (1128)	100 (3336)	100
7	tin, alkaline bath, flow-brightened, without intermediate layer (5μ)		97.5 (3864)		
8	tin, alkaline bath, flow-brightened, with intermediate Cu-layer (5 + 2μ)			67.5	
9	tin, alkaline bath, flow-brightened, with intermediate Ni-layer (5 + 2μ)			50	
10	cadmium, bright, not chromated	100	99	2	67
11	tin-zinc-alloy, mat, not chromated	100	92.5	50	80.8

rust coated within 1656 hours, the time for complete rusting is indicated in parenthesis. From the degree of rusting only these statements can be drawn: An outstanding performance was attained by the flow-brightened tin deposits with intermediate nickel layer. The best corrosion resistance of all test panels was obtained with the 10-μ tin-zinc alloy deposit.

Zn : Sn

The period of time to the first indication of tarnish and rust furnished valuable information for these test conditions. Therefore, it was unquestionably clear that rusting begins earlier on tin deposit panels than on those with zinc coatings since tin offers no anodic protection. The formation of tarnish films on chromated zinc deposits begins in the same length of time in which the first rust spots formed on tin deposit panels. Untreated zinc deposits showed the formation of tarnish even earlier.

Zn : Cd

In this relation no general conclusion can be drawn. Zinc coatings were better in regard to the first indication of red rust, but unchromated cadmium deposits were free longer from corrosion—except red rust.

Cd : Sn

Comparing cadmium and tin deposits the tendency was quite the same as with zinc and tin coatings: Rusting began earlier on the tin-plated panels, but the first indication of tarnish layers was earlier on cadmium. The rust area after conclusion of the test was the smallest on tin coating panels with intermediate nickel layer.

Zn : Sn-Zn, Sn : Sn-Zn

This test of the corrosion resistance of the tin-zinc alloy deposit compared zinc and tin coatings. The first indication of corrosion, except red rust, was the same as with chromated zinc deposits, red rust forms earlier than on zinc plated panels, but essentially later than on tinned steel. The percentage of rust area after conclusion of the test was the smallest on the alloy deposit panels. The 10-μ alloy deposit especially showed an outstanding behavior under this test conditions. Only flow-brightened tin deposits with intermediate nickel layer proved to be similarly corrosion resistant.

Cd : Sn-Zn

As to cadmium, the alloy deposit panels disclosed an inferior rust area after conclusion of the test. The beginning of white and red rust formation showed no significant differences.

(5) Outdoor Exposure Test

Table V shows the time to the first indication of rust and other corrosion products for 10-μ test panels. The percentage of rust area after conclusion of this test (8280 hours = ca. 1 year) is indicated in Table IX. Figures in parenthesis give the time for 100 per cent (or approximately 100 per cent) rusting of the test panel. In this test some groups of deposits acted very similarly so that it seemed advisable to compare these groups of deposits instead of giving a sequence of deposits. The first group was the zinc group, which showed the best performance. The medium group was represented by the cadmium, tin-zinc and flow brightened tin coatings with intermediate copper or nickel layer. The poorest behavior was found to be tin deposits without intermediate layer.

Going into details, the following may be stated:

Zn : Sn

Zinc deposits under all conditions were superior to tin coatings. Only tin deposits with intermediate layer exhibited an earlier formation of gray spots than unchromated zinc coatings.

Zn : Cd

Cadmium deposits were in general slightly inferior to zinc coatings. The formation of gray spots and gray corrosion products was the same as with unchromated zinc deposits.

Zn : Sn-Zn

Also in this relation, the zinc coating was superior except gray spots and gray corrosion products, which were formed earlier on unchromated zinc.

Sn : Sn-Zn

The alloy deposit, under all conditions, was better than the tin coating. Only on plated panels with intermediate layer was the rust area smaller than on the alloy deposit after conclusion of the test.

Cd : Sn-Zn

The actions of both coatings were very similar. The first indication of rust was superior with the cadmium deposit, as was the rust area after conclusion of the test on the 10-μ panels. However, with the 5-μ deposits, the first indication of gray spots and the final rust area were slightly better with the alloy coating.

Cd : Sn

Cadmium deposits were superior to tin coatings, with the exception of tin deposits with intermediate copper or nickel layer which were better, considering the time to the first indication of gray spots and the rust area after conclusion of the test.

S. C. Britton and R. M. Angles[5] performed a similar outdoor weathering investigation. However, they employed coating thicknesses of 0.3, 0.5 and 1 mil (7.5, 12.5 and 25 μ), while in this investigation 2.5, 5 and 10 μ were used. Out of the three different test locations only one (suburban climate at Perivale) was comparable with this investigation.

In general the tendency was the same in both investigations. But the statement in the Britton and Angles paper that tin-zinc alloy coatings were better than cadmium in delaying complete rusting could not be confirmed. The order of merit according to the investigation in question was therefore: Zinc-, cadmium-, tin-zinc-alloy-, tin (Britton and Angles: Zn, Sn/Zn, Cd, Sn).

The exposure times at Perivale (Britton and Angles' investigation) and Berlin (investigation discussed in this paper) for the first appearance of rust and complete rusting were shorter in Berlin. This indicates that the latter climate is more aggressive, it approaches the industrial climate of Oldham in Britton & Angles' paper.

VI. SUMMARY

A comparison of the corrosion resistance of electroplated zinc, cadmium, tin and tin-zinc alloy deposits in thicknesses of 2, 5 and 10 μ was made by means of salt spray, humidity, sulfur-dioxide carbon-dioxide, and outdoor exposure tests.

An evaluating system was developed using the percentage of rust area after conclusion of the test as means for obtaining numerical data on corrosion resistance. However, this system was not claimed the only conclusive means for evaluating the corrosion tests. Besides this the exposure time to the first indication of tarnish, red rust or other corrosion products was recorded and evaluated.

In comparing the different metal coatings, proper consideration was made for the deposit thickness and for the time element entering into the visual observation of the test panels.

Common observations:

a. In general matte and bright zinc deposits appeared to have the same corrosion resistance, in some cases bright deposits were somewhat superior.
b. Chromating improved the behavior of zinc coatings.
c. Flow-brightening of tin plates yielded a rise of corrosion resistance except in salt spray test conditions.
d. Intermediate layers increased corrosion resistance. Nickel was better than copper.
e. Tin coatings from the acid bath were more corrosion resistant than those from the alkaline bath.
f. Zinc deposit: especially chromated, offered in general a better behavior than tin, except acid tin in salt spray and industrial air tests.
g. Cadmium coatings offered a somehat higher corrosion resistance than zinc deposits, except in outdoor weathering and first indication of rust in industrial air (CO_2–SO_2 condition). Untreated cadmium was approximately equal to chromated zinc.
h. The behavior of tin-zinc-alloy deposits was generally between that of zinc and tin except in the salt spray test, where the alloy-coated steel rusted at a very low rate.
i. Comparing tin-zinc-alloy and cadmium deposits, the alloy-plated steel was inferior; it generally began to rust sooner. The rust area after some time was smaller on cadmium coated steel except with industrial air (CO_2–SO_2) and 2 μ with salt spray conditions, where the alloy was superior.
j. As to tin deposits, cadmium presented a similar tendency to zinc—i.e. cadmium coatings were better than tin deposits. In some cases cadmium was somewhat better than zinc. However, tinned-steel was superior to cadmium-plated considering the rust area after conclusion of the test under salt spray conditions, with the 2 μ deposit. In outdoor weathering only the tinned-steel with intermediate layer showed superiority. Also cadmium tarnishes earlier under humidity test conditions than acid-tinned steel and alkaline flow-brightened, and quicker in outdoor weathering than tinned-steel with intermediate layer.

ACKNOWLEDGMENT

The author wishes to express this appreciation to Schering, A. G., Berlin for permission to publish the information in this paper.

REFERENCES

[1]Halls, E. E., Metallurgia, (Manch.) **41**, 68 (1949).

[2]Frant, M. S., Plating, **45**, 157 (1958).

[3]Muller, K., Metallwaren-Ind. u. Galvanotechnik **49**, 220 (1958).

[4]Wolff, R. H., Metal Finishing, **56**, 46 (June 1958).

[5]Britton, S. C., and R. M. Angles, Metallurgia (Manch.) **44**, 185–191 (1951).

Dr. Heinz W. Dettner is a native of Duisburg, West Germany, and is now living in Western Berlin. He received his education at Berlin and Aachen Technical University, where he was awarded a master's degree in chemistry in 1944 and DSc degree in 1948.

After employment with various German electroplating supply houses as chemist and chief chemist, he joined the Schering A. G., Berlin as scientific adviser on the staff of the electroplating department.

His field of activity principally has been with the corrosion resistance of electroplated metal coatings, especially chromium. He has published many papers, mainly in German, and some books on electroplating. Dr. Dettner arranged the German edition of A. G. Gray's "Modern Electroplating."

A NEW ECONOMIC METHOD OF TREATMENT OF STAINLESS STEELS PRIOR TO CADMIUM PLATING FROM CONVENTIONAL CYANIDE SOLUTIONS

by LARISSA DOMNIKOV*

In some applications, it is desirable to plate 400 series stainless steels. The various types of stainless steel are similar to aluminum in that their surfaces are covered with a thin protective oxide film which is self-healing after being damaged. Due to the passivity of this film, it is impossible to obtain an adherent electrodeposit without a preliminary treatment which would remove the oxide film and, most important, to prevent it from reforming before the application of the deposit.

Various methods of removal of the passive skin by merely subjecting the steel to the action of acid solutions, with or without current, are not satisfactory, for as soon as the steel is removed from the acid and subjected to the action of air, the oxide film is immediately rebuilt due to the presence of the chromium alloying constituent which renders stainless steel its valuable characteristics. Even though the literature cites many successful methods of preplate treatment by pickling steel in hydrochloric or sulfuric acids of various concentrations, hot or cold, with or without the application of current, the author of this paper found that in her attempts to plate cadmium from the cyanide bath and employing the above preliminary treatments, she could not prevent the film formation in between the operations, no matter how fast the steel was transferred from the pickling bath to the rinse and to the plating bath.

A satisfactory solution to this problem is to use a plating bath with a sufficiently strong acid concentration which would provide a secondary pickling effect. In such a bath, the oxide film is completely removed, and immediately covering action takes place until a uniform coating is formed. The best results were obtained in strongly acidic, chloride-rich solutions. Thus, plating the stainless steel with copper presents no problem if an acid copper bath is used of a high-chloride concentration[1]. High-chloride nickel plating solutions can also be successful in a similar application.

However, electrodeposition of cadmium from cyanide solutions cannot be so easily solved because the basic cyanide solution does not remove the oxide film. Therefore, an undercoat of copper or nickel is necessary prior to cadmium plating.

The author in cooperation with Gerald Perrin, Norair process engineer, studied several methods. A copper plating solution of the following composition was used with success:

$CuSO_4$—0.66 oz/gal
HCl, 18Be′—50 per cent solution

The 400 series steel panels were treated anodically for 30 seconds followed by a cathodic treatment for 60 seconds, at room temperature, and the current density of 5–25 amp/sq ft. Prior to the treatment in the copper solution, the steel panels were subjected to the following cleaning procedure:

1. Cleaned in the alkaline cleaner at 190–210F, the current density of 50–100 amp/sq ft, 45 seconds anodically followed by 30 seconds cathodically, and again followed by 45 seconds anodically.
2. Rinsed in cold water.
3. Subjected to an acid dip in 25 per cent fluoboric acid solution for 5 seconds at room temperature.
4. Rinsed in cold water.

Another successful method of applying an undercoat includes the use of a high-chloride nickel strike solution of the following composition:

$NiCl_2 \cdot 6H_2O$—32 oz/gal
HCl, 18Be′—11 oz/gal

The steel panels were treated anodically for 30 seconds followed by 120 seconds cathodically, at room temperature and the current density of 50–75 amp/sq ft.

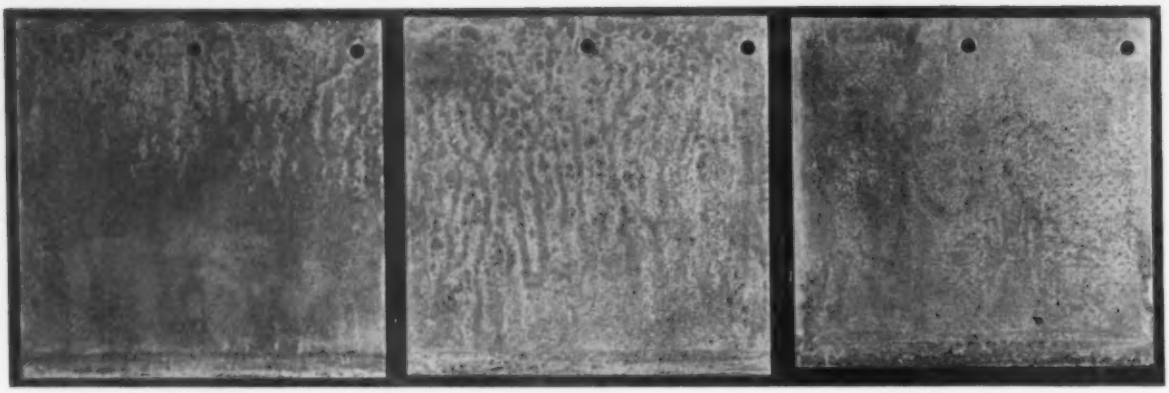
This undercoat was applied following the cleaning procedure mentioned above.

An alternative successful method of nickel strike employs a nickel sulfate solution of the following composition:

$NiSO_4 \cdot 6H_2O$—30 oz/gal
H_2SO_4 (sp. gravity 1.84)—6.6 oz/gal

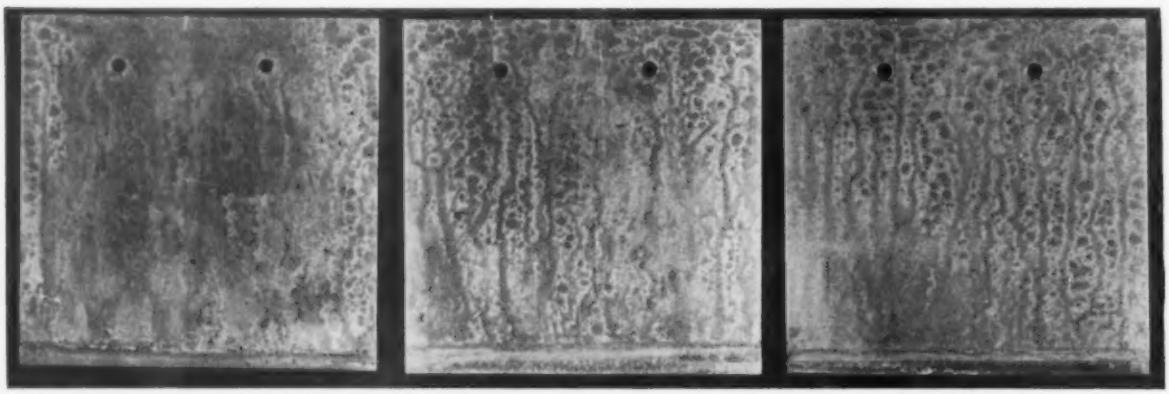
The steel panels were treated from 5 to 10 minutes cathodically at the current densities of 150–200 amp /sq ft and at the temperatures of 95–105F.

* Process Analyst A, Norair, A Division of Northrop Corporation, Hawthorne, California.



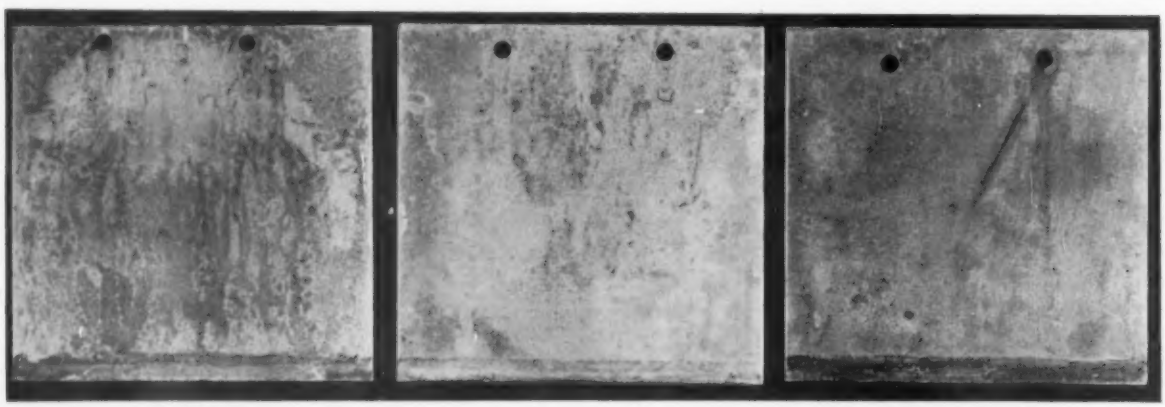
0.00025 Inch Cadmium Plate | 0.00050 Inch Cadmium Plate | 0.00075 Inch Cadmium Plate

Fig. 1—Panels which received nickel sulfate electrolytic pretreatment. Results of the 336 hr salt spray exposure.



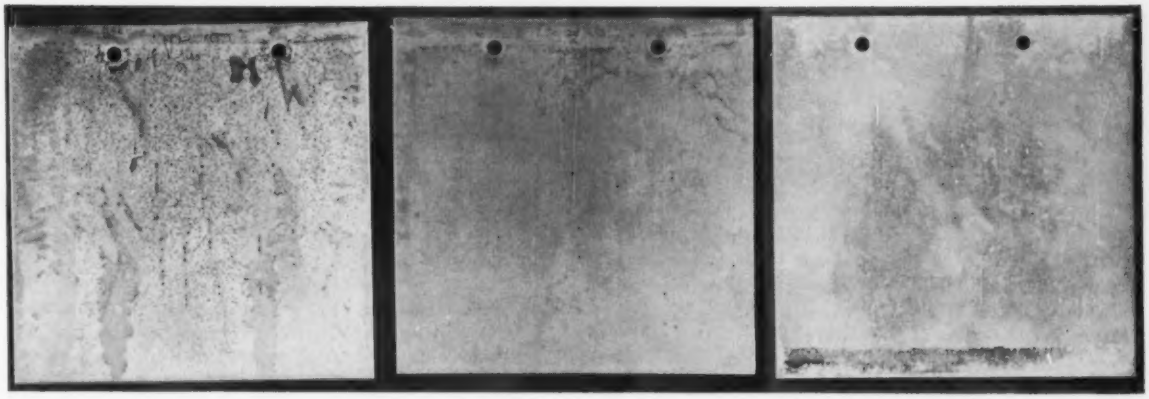
0.00025 Inch Cadmium Plate | 0.00050 Inch Cadmium Plate | 0.00075 Inch Cadmium Plate

Fig. 2—Panels which received nickel chloride electrolytic pretreatment. Results of the 336 hr salt spray exposure.



0.00025 Inch Cadmium Plate | 0.00050 Inch Cadmium Plate | 0.00075 Inch Cadmium Plate

Fig. 3—Panels which received copper strike pretreatment. Results of the 336 hr salt spray exposure.



0.00025 Inch Cadmium Plate | 0.00050 Inch Cadmium Plate | 0.00075 Inch Cadmium Plate

Fig. 4—Panels which received electroless nickel pretreatment. Results of the 336 hr salt spray exposure.

In spite of the fact that the above copper and nickel strike methods proved to be successful in producing fine adherent subsequent cadmium deposits from a conventional cyanide bath, they have one disadvantage—they require application of current, which involves electrical installation.

A plater may occasionally have a problem of plating stainless steel, but the cost of the additional electrical installation may be prohibitive.

The best solution to this problem would be to find a method of electroless application of the undercoat. The author and Mr. Perrin have developed a simple and economic method.

The steel object is first subjected to the cleaning process mentioned earlier in the article. Then it is treated in a hot (165F) 35 per cent sulfuric acid solution for two minutes without the application of current. A black film of finely divided carbon is formed on the object during the sulfuric acid treatment. (The film can be easily wiped off).

Following this immersion activation process, the steel object is given a flash of nickel in an immersion nickel bath of the following composition.

$NiCl_2 \cdot 6H_2O$—8.0 oz/gal
Boric Acid—5.5 oz/gal

The immersion time is one minute, the temperature of the bath is 160F, the *p*H is 4.3–4.7.

Upon removing the object from the nickel bath, it is given a quick rinse, followed by a cyanide dip in the solution containing 6 oz/gal of sodium cyanide. Then the object is cadmium plated in a cadmium cyanide bath. The carbon film is not soluble in the cyanide but is included in the cadmium deposit. Following the cadmium deposition, the object is given a supplementary chromate treatment.

The results of the 336 hr salt spray test for corrosion resistance of various thicknesses of cadmium deposit following the three electrolytic and the electroless preplate treatments mentioned above are shown in Figs. 1 to 4. The results indicate the superiority of the electroless method in producing corrosion resistant deposits.

Three thicknesses of cadmium deposit were tested: 0.00025, 0.00050 and 0.00075 inch.

Panels shown in Fig. 1 received the nickel sulfate electrolytic pretreatment. All three cadmium thicknesses show excessive spotting after 336 hours of salt spray exposure. Panels shown in Fig. 2 received the nickel chloride electrolytic pretreatment. The results of the salt spray are comparable to those of the nickel sulfate treatment—all three panels are heavily spotted. The salt spray results on the panels which received the copper strike pretreatment are shown in Fig. 3. The two panels with 0.00050 inch and 0.00075 inch deposits have some discoloration, whereas the panel with 0.00025 inch deposit is heavily spotted.

Fig. 4 shows the panels which received the electroless nickel pretreatment, after 336 hours of salt spray exposure. Only one panel, with 0.00025 inch deposit, has some indication of spotting, the other two panels have no spotting with the exception of a few isolated dots. (The variation of color on the panels is due to the salt deposit, which was not washed off, and due to the presence of the chromate film).

The adhesion of the cadmium deposits was tested by a bend test. The adhesion proved to be excellent for all four preplate treatments.

REFERENCE

1"Coppering of Stainless Steel," Metal Finishing, Sept. 1956. p. 74.

Larissa Domnikov was born in Odessa, Russia. She left Russia during World War II and came to the U.S.A. in 1946. In 1952 she became an American citizen. Mrs. Domnikov graduated magna cum laude from CCNY in 1955 with a BS in chemistry and is a member of Phi Beta Kappa.

She joined Northrop Aircraft, Inc., Hawthorne, California, in 1955 and worked in the Materials and Process Laboratory until July 1958. Her experience has been in the fields of electroplating and metal finishing. At present, Mrs. Domnikov is a process analyst with Norair, A Division of Northrop Corporation, Hawthorne, California. She has done translations of Russian scientific and technical papers for Northrop Aircraft, Inc., for translating bureaus, and for publication in technical journals.

THE ELECTROPLATING OF TIN ALLOY SOLDERABLE COATINGS ON FERROUS AND NON-FERROUS BASIS METALS*

by A. M. HOWARD and L. R. ROGERS†

"FOR WANT OF A NAIL the horseshoe was lost!!!!" with the ultimate loss of a kingdom, is told in an ancient children's poem. A similar situation faces industrial techniques concerned with the reliability of electrical connections which must be made by soldering.

A number of factors are involved in producing consistent, reliable, soldered joints, among these being proper surfaces, proper flux and proper solders. The electroplating art is primarily concerned with the first factor, which quite often proves to be the one determining whether consistent, reliable solder joints can be produced.

As more and more processes are revised and automated to eliminate hand soldering, the preparation of the surfaces for proper soldering may become the electroplaters responsibility. Many factors then must be known by the design and process engineers and the electroplater before a satisfactory surface for soldering can be prepared.[1] These factors can be listed as:

1. Basis Metal
2. "Abuse" Factor—the amount and type of handling a plated part will receive during the processing after plating and before soldering.
3. Storage time and conditions between plating and use.
4. Corrosion resistance required.
5. Method of forming the parts—whether deep drawn, stamped, extruded, machined, cast, etc.°
6. Allowable dimensional changes such as threaded studs, threaded holes, etc.
7. Method of soldering—whether by hand iron, torch, dip, ultrasonic, etc.
8. Type of flux—non-corrosive or corrosive type.
9. Soldering temperatures and time.

As an illustration of the effect of these factors we will take as a hypothetical part a deep drawn can from cold rolled steel. To it is attached by spot welding several small stainless steel threaded studs. The can will be used to enclose a small relay which will be mounted on a header and the header soldered by induction heating to the can using rosin flux and 50-50 tin lead solder and the unit then hermetically sealed. The completed unit will then be painted, except for the studs. The in-process time for these cans and headers will be four weeks, during which time they will receive no special protection but will be exposed to shop dirt and fumes, and the headers will be handled several times when the relays are mounted on the header.

We now know the conditions that must be met and can plan accordingly. With a dissimilar metal in the stud than is in the can, an activation treatment must be included in the cleaning procedure. The in-process time and storage conditions will pretty much eliminate the use of as-plated electro-tin and the maintaining of the threads on the studs will eliminate a tin dip coating. The corrosion resistance of the electroplate is unimportant as the paint will give the unit the necessary corrosion protection. However, the method of soldering and the requirements for a good solder joint certainly require a coating which will be readily solderable. Such a coating as a reflowed electro-tin or reflowed solder plate in a thickness of 0.0002 in. would certainly fulfill the requirements to produce acceptable units with a minimum of rejects caused by leaking of the solder joint.

After study of these factors, the proper coating and coating thickness can be specified. Coating is mentioned at this point rather than electroplate, as hot dipped coatings of tin and tin-lead alloys will often give the most economical solderable coating. The basic requirement of any of the coatings is satisfactory performance in process and service. However, this discussion will be limited to the electroplates.

Brief discussion will be made of the various tin and tin alloy electroplates which are considered to be really solderable, and the type of baths from which they can be plated. Bath formulations will not be listed as they can be found for most of these baths in the Metal Finishing Guidebook[2] and the manufacturers literature.

TIN

Tin may be plated from both acid and alkaline baths. The acid tin baths have an advantage in being used cold, have good anode efficiency but have relatively poor throwing power and present equipment corrosion problems. The alkaline tin baths, particularly the potassium stannate bath, have probably the highest throwing power of any plating baths, are easy to control, and will produce acceptable plate over a wide current density range. "High Speed" tin anodes are available which allow higher anode current densities than pure tin anodes. These anodes are cast with a small percentage of aluminum to promote anode corrosion. The deposit of tin from an alkaline bath is of higher purity than from an acid bath, as most common contaminating metals such as copper, zinc, nickel, iron, will not co-deposit with the tin from the straight alkaline bath and most of them will not stay in solution.

TIN-ZINC

This alloy can be plated from either acid or alkaline baths in almost any alloy composition. From a solderability standpoint, the 80 per cent tin 20 per cent zinc alloy appears to be the best. The acid bath is characteristic of most fluoborate plating baths in that rather narrow current density ranges must be followed to maintain alloy composition.[3] The alkaline bath requires rather close control, particularly of the free cyanide, free caustic, and metal content to maintain alloy composition. The tin-zinc plate has excellent solderability, good corrosion resistance, and retains solderability under adverse storage conditions. Alloy anodes are available for the 80-20 alloy.

TIN-LEAD

This alloy can be plated from a fluoborate bath in almost any alloy composition. The alloy composition is determined by the bath composition, and to a lesser extent the current density range. The bath composition is, of course, affected greatly by the anodes employed. The anodes are available for any tin-lead alloy in either cast or extruded form. It is the opinion of the authors that the extruded anodes are more satisfactory than the cast anodes because of more uniform density, finer grain structure, and freedom from gas porosity, which results in better anode corrosion. Cast solder anodes

*Branch Paper of the Indianapolis Branch of the American Electroplaters' Society.
†Steel Protection and Chemical Co., Inc., Mooresville, Indiana.

such parts is not properly prepared for plating by the described

is well adapted to the continuous electroplating of aluminum

will not corrode as smoothly, as they are generally cast wider and thinner than extruded anodes, may develop holes and break off before the anodes are completely consumed. Cast anodes have the advantage of more anode area per unit weight due to shape. The number of "points" on an anode is of minor importance in a tin-lead bath, as these "points" rapidly disappear in use. The bath for the best solderable coating is the 60 per cent tin 40 per cent lead bath which will produce the 60-40 solder plate. The throwing power of this bath is relatively poor, although the covering power is improved by tin flashing the work prior to solder plate. This alloy has very excellent solderability. On steel, the corrosion resistance of the coating is fair.

TIN-CADMIUM

This is one of the newer alloy plates that shows great promise from several view points.[4]

a. Corrosion resistance as good as cadmium.
b. Good solderability.
c. Good shelf life.

Unfortunately, little is available in the literature at the present time on plating these alloys. The cost of the plate is more than other baths due to the cost of the metals involved. Preliminary work performed by the authors indicates that where excellent solderability and good salt spray resistance is required, that the 60 to 70 per cent tin, 40 to 30 per cent cadmium alloys will satisfy requirements. These alloys can be plated from either an acid or alkaline solution. To the authors' knowledge, alloy anodes are not available for these alloys.

THE REFLOWING OF SOLDERABLE COATINGS

It will be well at this point to discuss the reflowing by heat of the tin and tin alloy electroplates. Generally this is done with a hot vegetable oil, such as palm oil or special tallow base tinning oils, or by the use of a furnace and flux. The oil reflowing is more adaptable to small parts, while the latter method is adaptable to strip or wire plating. The reflowing of the electroplate accomplishes the following:

1. Brightens the plate and actually fuses it to the surface of the basis metal. The alloy formation of tin and basis metal is less than with a hot tinned part because the temperature of reflowing is less than that for tinning and the dwell time at temperature is less.
2. The reflowing increases the solderability of the electroplate and increases the shelf life of the coating by a big factor. For example, as plated electro tin may exhibit good solderability for two or three weeks, while a reflowed electro tin coating may exhibit excellent solderability for a year or more.
3. The reflowing of the coating is one of the best quality control checks on the platers work. Improper cleaning prior to plating will be shown by "dewetting" of the plate during the reflowing. Plating thicknesses can be estimated fairly accurately from the appearance of the reflowed coating. Tin and tin-alloys on small parts must have a thickness of about 50 to 70 millionths (0.00005 to 0.00007) of an inch to brighten to a full bright surface in hot oil. The best appearance is obtained at a thickness of 0.0001 to 0.00015 inch. At a thickness of 0.0002 inch and above, excess metal flow begins to occur during reflowing which results in beadiness and lumping of the coating. With a solderable electroplated coating on aluminum, hot oil reflowing shows immediately if the electroplated coating has the necessary adhesion to the aluminum. It can be said that if the electroplate will not reflow properly, it certainly will not solder properly.

COMPARISON OF THE SOLDERABLE ELECTROPLATES

Comparison of the properties of the various electroplated coatings in decreasing order of performance are given in Table I.

PREPARATION OF BASIS METAL

The preparation of the basis metal for electroplating tin and tin alloys for solderability is as important as it is for any electroplating where maximum adhesion must be obtained. The cleaning of the basis metal will determine the solderability of the coating almost as much as the coating itself, as the basis metal must be wet by the solder when the electroplated coating is alloyed with the solder. A thin coating of dirt or oxide will prevent this and cause dewetting of the solder which is evidenced by the solder drawing into small beads or spheres on the surface. Cleaning methods on various basis metals and pitfalls that may be encountered, will be discussed.

Steel

After removal of normal shop dirt, drawing compounds, oil and the like, by the usual means, the metal surface should receive a light etch. This can be done by pickling in muriatic or sulfuric acid and removal of the carbon smut with a cyanide solution dip or a periodic reverse clean using a "deruster" type bath. These "deruster" type baths are composed of caustic soda, a chelating agent and sodium cyanide. They will very lightly etch steel when used anodically without raising a carbon smut, and will also clean terne plate sufficiently to allow plating directly to the terne plate coating. The authors have found the latter method to be very effective on steel parts which are not extremely rusty or scaly from annealing. Parts which are scaly must be pickled in strong acid for scale removal. It has been the authors experience also that deep drawn parts which have been annealed during the draw operation will quite often have an almost invisible film on them which will cause dewetting of a reflowed electroplate. The authors feel that this film is the result of the soap from the drawing compound being burned in during the annealing. This drawing compound is generally removed by vapor degreasing before annealing, but the metal soaps in the drawing compounds are not soluble in chlorinated solvents and a thin film may remain on the parts. If the surface of

TABLE I

A. Corrosion resistance
   1. Tin-Cadmium
   2. Tin-Zinc
   3. Tin, reflowed
   4. Tin, as plated
   5. Tin-Lead (60–40)

B. Retention of Solderability (Shelf Life) on Copper Base Alloys.
   1. Tin, reflowed
   2. Tin-Lead, reflowed
   3. Tin-Zinc
   4. Tin-Cadmium
   5. Tin-Lead, as plated
   6. Tin, as plated

C. Retention of Solderability (Shelf Life) on Ferrous Base Alloys.
   1. Tin-Lead, reflowed
   2. Tin, reflowed
   3. Tin-Zinc
   4. Tin-Cadmium
   5. Tin-Lead, as plated
   6. Tin, as plated

D. Ease of Bath Control.
   1. Alkaline Tin
   2. Acid Tin
   3. Tin-Lead
   4. Tin-Zinc
   5. Tin-Cadmium

such parts is not properly prepared for plating by the described methods, a dip for a few seconds in a 25 to 40 per cent nitric acid solution will result in sufficient etching to insure good results. The use of a tightly adherent copper flash on steel, brass, stainless steel and nickel parts prior to plating with a solderable coating is often a definite aid to a good finish.

Copper Alloys (Brass, Nickel Silver)

The easiest way to prepare these alloys for plating is by use of a nitric-sulfuric acid bright dip after removal of normal soils. Chromic acid type bright dips are not satisfactory, as a chromate film is formed which will interfere with the necessary adhesion of the plate. Leaded brass also does not respond well to bright dipping, as the lead may adhere to the part as lead sulfate, and not be removed through the subsequent cleaning before plating. After bright dipping it is desirable to dip the parts in a 10 to 20 per cent fluoboric acid solution to remove any immersion copper plate which may form on the parts in the rinse following bright dippi g. Brass may be etch cleaned with a periodic reverse system and the "deruster" type bath previously mentioned. The fluoboric acid will also impart a very light etch to the metal. A copper or nickel plate on brass alloys is also useful in extending the shelf life of the solderable coating by acting as a barrier layer between the basis metal and the solderable coating.

Copper

Copper can be prepared for plating by bright dipping in nitric-sulfuric acid bright dip or by cathodic treatment in a hot caustic cyanide solution.

Nickel, Stainless Steel and other Nickel Bearing Alloys

After removal of normal shop soils, it is necessary to activate the surface by either pickling in hot sulfuric acid, or by cathodic treatment in a nickel chloride strike solution containing nickel chloride and muriatic acid or cathodic treatment in a sulfuric acid solution. Better results will be obtained with the nickel strike than with the other treatments, but complete activation of the surface must occur or the electroplate will not be firmly adherent and the parts will not solder properly. If the work is put through the nickel strike in a plating barrel, it is essential that the copper in the nickel strike be kept to an absolute minimum. For rack work, copper in small amounts in the nickel strike will not interfere if the work is always "live" when contact is made with the bath.

Aluminum

There are many processes for plating aluminum so that it will become solderable, but most of them involve a zincate process with subsequent deposition of copper, nickel, or silver, and then the solderable coating.

The adhesion of the intermediate coating of zinc and the adhesion of the copper or nickel to it are the "secret" to plated aluminum that can be soldered. The thickness of the copper or nickel is of minor importance to the initial solderability but of importance to resolderability. To attain this adhesion, it is necessary to have a knowledge of the aluminum alloy so that the proper alkaline and acid etches can be employed. The zincate treatments which produce the thinner zinc deposits are generally more satisfactory than those which produce the heavier zinc deposits.

The authors have been allowed a patent on a fully electrolytic process for plating aluminum which uses an electrolytic strike of lead and zinc prior to a copper strike, eliminating the need for a zinc immersion treatment. The results from this process have been generally superior to the usual zincate treatments, both in time cycle and adhesion. This process is well adapted to the continuous electroplating of aluminum wire.

However, the fact still remains that the electroplated coating on the aluminum becomes solderable and not the aluminum itself.

Magnesium or silicon bearing aluminum alloys will generally give the most trouble in plating for maximum adhesion. Quite often, a dip in 10 to 20 per cent fluoboric acid solution following etching and nitric acid dipping will produce the required results. The use of a fluoride bearing nitric acid bath may be necessary for the silicon bearing aluminum alloys. Aluminum surfaces can be given an anodic etch in fluoboric acid also. This can also be very helpful for the magnesium and silicon bearing aluminum alloys. The double zincate treatment is almost a necessity for satisfactory performance of the electroplate.

Treatment in hot oil at 400° to 500F for electroplated aluminum is one of the very best and fastest means of checking the adhesion of the electroplate. The plate after such treatment should show no blisters, if the surface is to be expected to produce a soldered joint with good bond strength.

Many articles have been published on the preparation of metallic surfaces for electroplating. Among these is the report of Project 12 of the AES and reports from Section K, Subcommittee IV of ASTM Committee B-8.

Stripping of Solderable Coatings from the Basis Metal

In the event that the tin bearing solderable coatings must be stripped for rework or replating, it is the authors experience that proprietary strippers of an alkaline type are more satisfactory and economical than the use of a fluoboric acid-hydrogen peroxide mix. The alkaline type will etch copper or brass slightly but will not attack steel, while the fluoboric acid-hydrogen peroxide mix will attack steel, brass, copper, or nickel if it is not controlled. Solderable coatings on aluminum can, of course, be very easily stripped by the use of nitric acid. Fluoride-bearing nitric acid should not be used for stripping coatings from aluminum, as these baths will attack and etch aluminum.

ELECTROPLATED STRIP AND WIRE FOR SOLDERABILITY

Although tinned steel, brass and copper have been produced for many years, it is only in the past 10 to 15 years that these materials in strip and wire form have been tinned by electroplating. Hot tinned strip and wire, although exhibiting a fine appearance, does not always exhibit excellent solderability. Tin plated steel strip, of course, is primarily produced for the container industry, where resistance to corrosion to food acids and solderability is quite important. The large tonnages of this are now produced by electrolytic tinning and reflowing rather than by hot tinning because of the saving in tin metal.

Brass and copper wire and strip have been hot tinned rather than electroplated primarily because of difficulty in cleaning and until 10 to 15 years ago, lack of a good electroplating process. The primary reason in the past for tinning copper wire was to make a barrier layer between the rubber insulation containing sulfur and the copper. Plastic insulations have decreased this demand. Tinned brass wire and strip is used primarily in the electronic and electrical industry.

The electroplating of wire and strip present problems not encountered in normal plating operations. For example, no individual operation in the process can take more than a few seconds, or the plating machine will become extremely long if speeds of 500 to 1000 feet per minute are anticipated. With such high linear rates of agitation, extremely high current

TABLE II

Horizontal Machine

Advantages	Disadvantages
1. Little or no bending of wire or strip.	1. Must be composed of short cells for contact purposes.
2. Less pulling power required.	2. Tank seals or weirs present problems of corrosion of equipment.
	3. Machine must be lengthy for wire speed to be obtained.

Vertical Machine

Advantages	Disadvantages
1. Each top roller can be a contact point.	1. Limited to easily bent material.
2. a lot of footage in a machine with a minimum of floor space.	2. Requires more pulling power, although for fragile wire each top roller can also be a driven roller.
3. Dragout and machine corrosion are more easily controlled.	

densities are possible and necessary. Current densities of 500 to 2500 asf are not at all uncommon in high speed wire and strip operations. Such high current densities then bring up the problem of contacts, and the resistivity of the material itself which can become a big factor. Contact to the wire or strip, of course, must be made while the strip or wire is out of solution. The flexibility of the wire or strip then fairly well determines whether the machine will be a horizontal or vertical type machine.[5] Each type has advantages and disadvantages as shown in Table II.

The electrolytic tinning of steel strip is more easily accomplished than brass strip because of the comparative ease with which steel can be cleaned and etched. A normal cathodic clean and light acid etch is not sufficient for brass to attain the cleanliness necessary for properly tinning brass. A bright dip is not practical because of machine corrosion problems and difficulty of control. An ammonium persulfate bath can be used which will etch the brass lightly before plating or a cathodic or anodic treatment in a caustic cyanide bath containing a chelating agent, will prepare the brass to take plate. Proper surface preparation is as important as with small parts if satisfactory results are to be obtained.

The reflowing of coatings on strip or wire can be done with hot oil, although it is more commonly done with heat and a flux. The flux can be a wet flux of zinc chloride, ammonium chloride, sodium chloride, or a dry flux of acidic gases. The heat may be radiant, resistance or induction. A number of reflow or fusion methods have been patented.

The electrolytic tinning of brass or copper has definite economic advantages over hot tinning, in that contamination of the bath does not occur as with a hot tin bath. In a hot tin bath, a copper-tin alloy is formed which must be cleaned from the pot periodically as sludge. Also, thickness is much easier to control with electrolytic tinning than with hot tinning and less metal is required for the same quality of product.

The authors have developed a process for the plating of aluminum wire continuously for which a patent has been allowed. In their method, an electrolytic lead-zinc strike of 3 to 5 sec prior to a copper strike eliminates the zincate treatment. All of the zincate treatments in use at the present time are too time consuming to allow their easy adaptation to aluminum wire plating. A 15 to 30 sec zincate immersion time does not lend itself very well to a high speed plating process.

The authors have successfully electroplated solderable coatings on aluminum wire from 10 to 24 gauge in various alloys and at speeds of 150 to 200 feet per minute on pilot line equipment.

With the advent of automation and printed circuitry, plated snap-off terminal strip has become an important item to the electronic industry. Such terminal strip is often made from tinned strip, but the raw edges from stamping interfere with subsequent soldering. In such event, the strip is plated after stamping. The mechanical handling of the strip during and after plating is more of a problem than the plating itself. The strip must not be distorted during handling, or it will cause difficulty in the machines which feed it to the circuit boards.

In conclusion, for surfaces to be properly prepared for soldering, it is necessary that a close relationship exist between the design and process engineers and the electroplater in order that the proper coating and processing be specified. It is not enough to simply state on a process drawing "Tin Plate" and then leave the plating problem to the electroplater. It is only when the proper coating and processing are specified that the electroplater can produce a coating which will perform satisfactorily in service.

REFERENCES

[1]Proceedings of the Second RETMA Conference on Reliable Electrical Connections, 1956, RETMA, New York 36, N. Y.

[2]Metal Finishing Guidebook Directory, 1958, Finishing Publications, Inc., Westwood, N. J.

[3]Cohen, Bennie, "A Study of Cadmium Tin and Tin-Zinc Alloy Electrodeposits," pp. 963–968. Vol. 4, No. 9. Plating (1957).

[4]Davies, A. E., "Electrodeposition of tin-cadmium alloy from a Stannate-Cyanide Solution," Bull. Inst. Metal Finishing, pp. 43–58 (1956).

[5]Graham, A. K., Electroplating Engineering Handbook, Reinhold Publishing Corp., 430 Park Ave., New York. (1955).

Addison M. Howard graduated from Colorado College in 1946 with a BA degree and received the MS degree from Iowa State College in 1951. He worked for the DuPont Co. from 1951 to 1952 and was chief chemist at the Allis Chalmers Manufacturing Co., Terre Haute Works from 1952 to 1955. Since 1955 he has been with the Steel Protection & Chemical Co., Inc. as a chemist and in 1956 was promoted to the position of company treasurer. He has served the Indianapolis Branch of the American Electroplaters' Society as librarian and as secretary.

Lorlys R. Rogers has been president of the Steel Protection & Chemical Co., Inc. since its inception in 1937. Prior to that date he had been affiliated with Reilly Tar & Chemical Corp., Johns-Manville Sales Corp., Ford, Bacon & Davis, Wailes, Dove, Hermiston Corp., and the Cinakol Chemical Corp.

Semi-Annual Meeting

COMMITTEE B-8

AMERICAN SOCIETY FOR TESTING MATERIALS

February 5-6, 1959
Pittsburgh, Pennsylvania

Summary by
DR. EDWARD B. SAUBESTRE
Technical Director
Enthone, Inc.
New Haven, Conn.

Subcommittee I (Specifications):

Chairman—FIELDING OGBURN

Dr. F. Lowenheim reported for Section B (Definitions) that an extensive list of definitions has been prepared, and, after a few additional revisions, will be submitted to Sub-I for letter balloting. W. Moline reported for Section C (Electroless Nickel) that the Monograph on Electroless Nickel is now complete, and that it should be published later in the year. Dr. E. Saubestre reported for Section F (Marking of Plated Coatings) that efforts to obtain customer and purchasing agent acceptance of markings for plated coatings will be initiated as soon as a new method of designating ASTM specifications of coating types has been adopted. D. M. Bigge, chairman of a task force in charge of revising thickness requirements in nickel plating specifications and revisions in the method of designating coating types, recommended the following change in the specification for nickel and chromium plating of zinc base die castings:

A new type of coating is to be designated as Type DZ, with the following thickness requirements:

Cu + Ni	2 mils (min.)
Cu	0.2 mils (min.)
Ni	1 mil (min.)
Cr	0.01 mils (min.)

It was also decided in the Sub-I meeting to re-examine the specification on lead coatings.

Subcommittee II (Performance Tests):

Chairman—WALTER L. PINNER

Section A reported to the Sub-II meeting on the current status of the Program 4 copper-nickel-chromium panels on exposure at Kure Beach, N. C. The report as presented engendered considerable discussion and some amount of disagreement. As a result, publication of the report, which deals with such matters as effect of plater-to-plater variability, Watts vs. bright nickel, duplex nickel coatings, value of copper undercoats, and related matters, will be delayed until after the fall meeting of B-8. Dr. F. Lowenheim reported for Section E on the solderability of tin plated coatings.

Specimens have been exposed for three months under controlled conditions of temperature and humidity, and also in a warehouse under uncontrolled conditions. The results obtained were quite erratic, and the exposure program will therefore be continued before conclusions are drawn. J. W. Kerstetter reported that Section F has almost completed the plating of aluminum panels for outdoor exposure testing.

Subcommittee III (Conformance Tests):

Chairman—A. D. SQUITERO

Nearly the entire Sub-III meeting was taken up with a discussion of the report of Section B (Accelerated Corrosion Tests) presented by A. Mendizza. He proposed setting up a program for examining and correlating the results of the following tests:

1. Conventional salt spray test
2. Acetic acid salt spray test
3. CASS (acetic + copper salt) salt spray test
4. Corrodkote

Nickel-chromium plated specimens would be plated under controlled conditions, exposed at Kure Beach and Detroit, and compared with similarly plated specimens tested in several laboratories by the above four tests.

Subcommittee IV (Electroplating Practice):

Chairman—DR. EDWARD B. SAUBESTRE

Dr. B. Knapp reported for Section N, and indicated that a new recommended practice for plating nickel on nickel will soon be ready for general distribution. This is designed to apply primarily to the production of duplex nickel coatings. H. Kafarski reported for Section W (Industrial Water for Electroplating) that recommendations on the contamination limits for water used in various plating operations will soon be ready for distribution to the Subcommittee. Mr. B. Cohen was charged, as chairman of Section C (Chromium on Chromium), with preparing recommendations on methods for reclaiming hard chromium plated parts, including both methods for plating chromium over chromium, and for plating chromium over parts in which bare steel shows, in addition to the chromium plating.

Subcommittee V (Conversion Coatings):

Chairman—GEORGE E. BEST

Dr. R. E. Harr reported for Section B that the exposure program of chromated zinc plated steel panels at Kure Beach, N. C. had been terminated, since little change in appearance had been noted in two years. It is thought that the surprisingly good behavior of untreated zinc plated panels is due to the storage of these panels for some time in polyethylene bags prior to exposure. A. Mendizza reported that a new program will soon begin in Section B, which will examine the importance of the hexavalent chromium content of the chromate film. The effect of organic contaminants on humidity testing will also be explored.

Dr. Harr also reported on the activities of Section D on chromated cadmium plated steel panels. At Kure Beach, little change has been noted in the panels after one year, except in the cases where other metals were coupled to the chromated cadmium plated steel surfaces. Copper couples formed the worst stains, while Almag 35 and brass couples caused little staining. Stainless steel couples rusted, also causing some rust stains on the cadmium plated steel. At Rock Island, Ill. all of the chromated panels have faded a bit after one year of exposure. The copper and brass couples showed the greatest amount of deterioration. Somewhat similar results were obtained after one year of exposure at New York.

It is expected that at the next meeting, progress reports will be available from sections dealing with phosphate treatments, organic finishes, and treatments on aluminum and zinc.

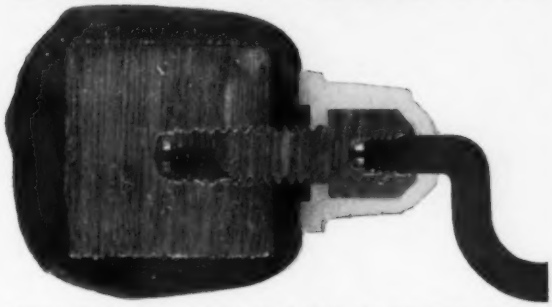
ROTO-FINISH APPOINTS ABRASIVE SPECIALISTS

Abrasive Specialists of Milwaukee has been appointed Wisconsin distributor for Roto-Finish Co.

The new distributor covers the entire state of Wisconsin and employs a staff of six sales representatives.

Modern warehouse facilities, located in Milwaukee, make possible adequate distributor stocks.

LEAK-PROOF!



NEW DAVIES REPLACEABLE RACK TIP STUDS

This cross-section photo . . . 3 times life-size . . . shows how the Davies-developed polyethylene stud cap seats tight in the plastisol rack coating.

In two years of tests, not one drop of solution leaked through. If you want more life from studs and spines . . . and less rack rebuilding . . . you want Davies racks with leak-proof studs.

For details, call or write

Davies® Supply & Manufacturing Co.
4160 Maramec St. ST. LOUIS 16, MO.

Branches:
813 W. 17th St. Kansas City 8, Mo.
2547 Farrington Dallas 7, Texas

USE READER SERVICE CARD; INDICATE A 520.

USED EQUIPMENT

POWER UNITS

4000 Amp., 12 volts Rectifier—Bart Messing
4000/2000 Amp., 7½/15 volts M-G Set—Chandy
1500 Amp., 12 volts Rectifier—H-VW-M
1500 Amp., 50 volts M-G Set—Columbia
1500/750 Amp., 6/12 volts M-G Set—Elect. Products
1000 Amp., 40 volts M-G Set—Chandy
1000/500 Amp., 6/12 volts M-G Set—H-VW-M
1000 Amp., 12 volts Rectifier—Rapid Elect.

TANKS

1—Stainless 5′ wide x 5′ deep x 12′ long
1—Plastic lined 4½′ wide x 6′ deep x 24′ long
1—Steel drying tank 13′ wide x 6′ deep x 16′ long

REFRIGERATION UNIT

10 Hp Worthington Compressor with tank and controls

L. J. LAND, INC.

P. O. Box 689 Weehawken, N. J. UN 4-1010
(In New York City—CAnal 6-6976)

USE READER SERVICE CARD; INDICATE A 522.

THE NEW VERSATILE NON-DESTRUCTIVE COATING-THICKNESS TESTER

DERMITRON

Unit Process Assemblies, Inc., pioneers in non-destructive testing and specialists in electronics for metal finishing, offer their latest DERMITRON D-2 with these features:

■ Measures plated coatings on steel, brass, copper, zinc die-cast, aluminum, bronze and other metals; also, nickel on steel. ■ Measures anodize and hard-coat on aluminum and magnesium; also, paint, porcelain, organic coatings on non-ferrous metals. ■ Measures metal coatings on plastics, ceramics and other non-metallic materials. ■ Available with FOUR measuring probes for extra-wide thickness ranges from thin to thick deposits. ■ Only ⅛" circle area required for measurement. ■ You get fast, accurate, direct readings, plus versatility and portability. ■ Sorts metals and alloys.

Write for latest brochure and questionnaire to help solve your thickness testing problems.

UPA **UNIT PROCESS ASSEMBLIES, INC.**
61 East Fourth Street • New York 3, N. Y.

Sethco "Canned" FILTER PUMP

ALL-IN-ONE • LEAKPROOF • PORTABLE

Model SEI-10

the PUMP is housed in the MOTOR

STAINLESS STEEL FILTER CHAMBER
OR . . . FULL VIEW CHAMBER

FILTER CHAMBER: SEI-10; Stainless steel 304. LEI-10; High temperature Epoxy-Lucite to 140°F. PEI-10; Epoxy-Pyrex to 250°F.
FILTER TUBES: Cotton, Dynel, Porous Stone or Porous Carbon.
CANNED PUMP: Corrosion resistant stainless steel, centrifugal, self-lubricating and leakproof. No seals, no stuffing box needed.
MOTOR: ⅛ HP, 110v, 60cy, 1 ph, totally enclosed. With thermal starting and overload relay.

Recommended for: Precious Metal Plating Solutions, Ultrasonic Cleaners, Solvents, Hydraulic Fluids, Radioactive Liquids, Aqueous Liquids pH 5.0 or above.

Sethco MANUFACTURING CO.
2290 Babylon Tpke.
Merrick, L. I., N. Y.

Please send your illustrated fact folder
Name .....
Address .....
City ..... State .....
Att: .....
Application: .....

USE READER SERVICE CARD; INDICATE A 521

USE READER SERVICE CARD; INDICATE A 523.

(1) Baltimore-Washington Branch host at luncheon for National Officers, speakers, guests and Branch Officers (2) The day's speakers, left to right, Dr. W. Andrew Wesley, Dr. William Blum (chairman), John G. Beach, Dr. Abner Brenner (3) A view of the Educational Sessions (4) Part of the head table, left to right, Branch First Vice President E. E. Oberland, Mrs. Oberland, National President Herberth E. Head, Mrs. Huston, Past President K. B. Huston (chairman) (5) A view of the banquet audience (6) The other part of the head table, Dr. H. L. Dryden (principal speaker), Mrs. Dryden, Dr. Blum, Mrs. Blum, NEPA Charter Members Justus A. Stremel and F. F. Pierdon (7) Ovation for Charter Member Pierdon (8) Three generations of AES Pierdons, general chairman Arthur G. Pierdon at his father's right (9) Dr. Dryden (10) Charter Member Stremel (11) National President Head displays the gold-plated "Pot" of the Order of Past Presidents awarded to him. Left to right, Third Vice President Chester G. Borlet, Second Vice President Wesley, First Vice President Ralph D. Wysong, Mr. Head, Mr. Huston, National Executive Secretary John P. Nichols (12) President Head receives the "Pot" from Past President Huston (13) Charter Member Stremel, Mr. Head, Mr. Huston, Dr. Blum and Charter Member Pierdon bridge five decades of AES.

GOLDEN JUBILEE OBSERVANCE IN NATION'S CAPITAL

Exactly fifty years and one day after the April 10, 1909 creation of the American Electro-Platers Association of the United States and Canada (NEPA), today's half-century old American Electroplaters' Society (AES), that event was lavishly commemorated at a GOLDEN JUBILEE Educational Session and Banquet conducted by the AES's Baltimore-Washington Branch at the Statler Hotel, Washington, D. C. Saturday, April 11, 1959. By its merit, the event is destined to stand out among the AES's outstanding FIFTIETH ANNIVERSARY observance elements.

That Washington Saturday dawned bleak and rainy. The Branch's two luncheons, one for its many honored male guests, the other for the ladies of its guests, were nevertheless both well-attended and well-considered. With Dr. William Blum, eminent scientist, presiding, the Educational Session that followed the luncheons starred three experts, namely Dr. W. Andrew Wesley discussing, "Causes and Remedies for the Corrosion of Nickel Chromium Coatings"; John G. Beach presenting "Plating on Unusual Metals" and Dr. Abner Brenner delivering his paper, "Deposition of Less Common Metals".

Though vying with Washington's famed Cherry Blossom Festival parade, the GOLDEN JUBILEE Banquet held its own by the quality of its own program. The parade of AES speakers included Justus A. Stremel and Fred F. Pierdon, two of the five AES founding fathers still living. Father of Arthur G. Pierdon, the event's General Chairman, Fred Pierdon spoke on "Plating Fifty Years Ago". A dramatic tribute to the deceased founders of the AES next followed with the audience standing in reverent memorial while each individual's name was read by AES Past President Kenneth M. Huston, toastmaster. Then the banquet heard Mr. Stremel's account of the birth of the Society.

National President Herberth E. Head was next awarded the traditional "pot" of the Order of Past Presidents, and he responded with an interesting presentation of "The AES Today". Introduced by Dr. Blum, the principal speaker, Dr. Hugh L. Dryden, Deputy Administrator of the National Aeronautics and Space Administration, discussed, "Some Problems of the Space Age". Pinch-hitting for Branch President Carl H. Thiede, absent on a business trip, First Vice President E. E. Oberland presided at the luncheon and delivered the Branch's welcome at the banquet.

The large number of Branch honored guests included, beside all six AES National Officers, five Past National Presidents, namely Mr. Huston and M. R. Caldwell, C. C. Conley, Samuel Heiman and Francis T. Eddy. Among them were not only many heads of other AES Branches but also A. P. Munning of the Metal Finishing Suppliers' Association and George W. Taylor of the National Association of Metal Finishers.

William Chase, bellwether in the organizing of the Baltimore-Washington Branch in 1928 and chartering in 1929, was also among those present. The golden-colored printed program of the event was another of the event's assets. A rich array of door prizes went to many fortunate winners—and the crowded dance floor attested to the quality of Washington music during AES's GOLDEN JUBILEE in the nation's Capital.

AES NEWS

GOVERNOR G. MENNEN WILLIAMS TO OPEN GOLDEN JUBILEE CONVENTION

Proclaimed "American Electroplaters' Society GOLDEN JUBILEE Week in Detroit" by edict of Mayor Louis C. Miriani, the week of June 15–19, 1959 will be featured by the AES's mammoth GOLDEN JUBILEE Convention and Industrial Finishing Exposition, including its Fifth International Conference on Electrodeposition and Metal Finishing.

The GOLDEN JUBILEE Convention will make its debut on Monday, June 15 at a Grand Opening Session starting at 10 a. m. in the Grand Ballroom of the Statler-Hilton. Officially greeted by a message from the President of the United States, the large assembly will be welcomed personally to Detroit by Mayor Louis C. Miriani.

Governor G. Mennen Williams will himself be present and will express the State's salute to the AES upon its FIFTIETH ANNIVERSARY. Irving A. Duffy, vice president, Ford Motor Company, will deliver the keystone address.

A tribute will be paid to the memory of the Society's honored dead, including Founder Charles Henry Procter and AES's other deceased founding fathers. The assembly will have an opportunity to view and greet AES's living Past Presidents and Honorary Members.

Other features of the Opening Session will be the announcement of the second winner of the AES's highest scientific honor, namely its AES Scientific Achievement Award. First winner was Dr. William Blum who himself will deliver the first "William Blum Lecture" at the Grand Opening of the AES's International Conference scheduled for 2 p. m. that same day in the same Grand Ballroom. Dr. Blum will discuss, "Education and the Electroplating Industry."

Governor G. Mennen Williams

Mayor Louis C. Miriani

GOLDEN JUBILEE EDUCATIONAL SESSIONS PROGRAM FINALIZED BY EDITORIAL BOARD

At its meeting held at National Headquarters, Friday, March 20, 1959, the Editorial Board finalized and "froze," the program of the Fifth International Conference on Electrodeposition and Metal Finishing that will constitute the educational sessions phase of the GOLDEN JUBILEE CONVENTION to be held in Detroit, Michigan, June 15–19, 1959. As finalized, the program is presented on Page 501 of this issue of PLATING MAGAZINE.

The final AES program was presented to the Board for consideration by International Conference Chairman Walter L. Pinner, an AES Past President and a member of the Editorial Board. It encompasses 44 papers grouped into eleven sessions. These include 23 papers by American experts; nine by English authorities, four by French scientists, two by German authors and the single approved papers respectively fathered by learned men from India, Switzerland, Canada, Australia, Holland and Italy. Three of the eleven sessions will be beamed exclusively to organic coating. Nine of the sessions will be held at the Statler-Hilton Hotel, the remaining two will be staged at the Artillery Armory, site of the AES's concurrent GOLDEN JUBILEE EXPOSITION.

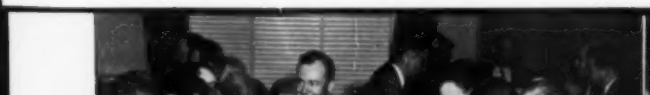
Sessions Chairmen will include electroplating and metal finishing leaders of the United States, England and Canada. The featured event of the International Conference will be the first "William Blum Lecture" which will highspot the Grand Opening of the Conference in the Grand Ballroom of the Statler-Hilton, Monday at 2 p. m. sharp. It will be delivered by the renowned scientist, Dr. William Blum, first winner of the AES Scientific Achievement Award, the Society's top scientific honor.

Chairman John P. Nichols presided at the Board meeting which was attended by Dr. Abner Brenner, G. Ross Davidson, S. Lewis Doughty, Robert A. Ehrhardt, James H. Lindsay, Walter L. Pinner, William H. Safranek, William M. Tucker and Rodney Leeds.

TO ALL BRANCH SECRETARIES

A complete list of all of your Branch Members in good standing as at June 30, 1959 is due in the hands of the National Executive Secretary by not later than July 15, 1959 as per Part II, Article V, Section 4 of the AES Bylaws. Your Branch will be billed for Per Capita Taxes for the fiscal year commencing July 1, 1959 and ending June 30, 1960 shortly thereafter based upon your filed list.

The tenure of your accredited Delegates/Alternates expires at the first Branch meeting following the June 18, 1959 Annual Meeting of the Supreme Society (or until their successors are duly elected and qualify). A list of your elected 1959-1960 Delegates/Alternates is due in the hands of the National Executive Secretary by not later than November 2, 1959 as per Part II, Article VII, Section 1 of the AES Bylaws. An official form will be sent to each Branch for the return of these data by Bylaw deadline signed by the Branch President and Branch Secretary.



BEFORE THE SUPREME SOCIETY

AGENDA
FIRST BUSINESS SESSION

GRAND BALLROOM
STATLER-HILTON HOTEL, DETROIT
MONDAY MORNING, JUNE 15, 1959

1. **Call to Order, GOLDEN JUBILEE ANNUAL MEETING.**
2. **Roll Call of Officers.**
3. **Report of Credentials Committee.**
4. **Roll Call of Delegates.**
5. **In Memoriam.**
6. **Reports of Officers (Published Copies in DELEGATES KITS):**
   (a) President
   (b) First Vice President
   (c) Second Vice President
   (d) Third Vice President
   (e) Past President
   (f) Executive Secretary
7. **Reports of Standing and Special Committees (Copies in DELEGATES KITS).**
8. **Report on New Branches.**
9. **1958–1959 Financial Statement and 1959–1960 Budget (Copies in DELEGATES KITS).**
10. **Report of Paper Awards Committee and Presentation of Awards.**
11. **Announcement of Board Appointments To:**
    (a) Editorial Board
    (b) Research Committee
    (c) Public Relations Committee
    (d) Election Committee
    (e) Honorary Membership Awards Committee
    (f) Educational Committee
    (g) Membership Committee
    (h) Publications Committee
    (i) Scientific Achievement Award Committee
12. **Presentation, Proposed Revisions, Constitution and Bylaws.**
13. **Business Brought for Discussion by Delegates.**
14. **Recess of GOLDEN JUBILEE ANNUAL MEETING.**

AGENDA
SECOND BUSINESS SESSION

WAYNE ROOM, STATLER-HILTON HOTEL
THURSDAY, JUNE 18, 1959

1. **Call to Order, GOLDEN JUBILEE ANNUAL MEETING.**
2. **Roll Call of Officers.**
3. **Roll Call of Delegates.**
4. **Roll Call of Living Past Presidents.**
5. **Financial Statement (1958–1959) and Proposed Operating Budget (1959–1960)**
   (a) Action on Proposed Constitutional and Bylaw Amendments proposed by Sixth Interim Meeting of Supreme Society and sponsored by Five or More Branches:
   (1) **Per Capita Tax Increase—**
   Constitution Part I, Article V, Section 3.
   Bylaws Part I, Article V, Section 2, 3.
   Bylaws Part II, Article V, Section 5.
   Bylaws Part II, Article VIII, Section 1.
   (2) **September 1 Per Capita Tax Due-Date—**
   Bylaws Part I, Article V, Section 2.
   Bylaws Part II, Article V, Section 5.
   (b) Action on Proposed Operating Budget (1959–1960).
6. **Action on Other Proposed Constitutional and Bylaw Amendments:**
   (a) **Honorary Member Dues—**
   Constitution Part I, Article V, Section 2.
   (b) **Election of Officers—**
   Constitution Part I, Article IV, Section 1.
   (c) **Minutes of Annual Meeting—**
   Constitution Part I, Article VIII, Section 3.
   (d) **Branch Exhibits—**
   Bylaws Part I, Article III, Section 14.
   Bylaws Part I, Article VI, Section 8.
   (e) **Interim Meeting—**
   Bylaws Part I, Article VI, Section 9.
7. **Report on Membership Competition. Presentation of Awards.**
8. **Action on Nominees for AES Honorary Membership. Announcement of Award of Merit winners.**
9. **Reports of Special Committees:**
   (a) Appraisal Committee as to the Need for a Convention Planning Committee.
   (b) Appraisal Committee as to the Need for a Long-Range Planning Committee.
10. **Introduction of 1959 "AES Scientific Achievement Award Winner".**
11. **Business Brought for Discussion by Delegates.**
12. **Discharge of 1958–1959 Special Committees.**
13. **Nominations and Election of 1959–1960 Officers:**
    (a) President
    (b) First Vice President
    (c) Second Vice President
    (d) Third Vice President
14. **Installation Ceremony.**
    (a) Installation of Newly Elected Officers.
    (b) Presentation of Gavel to New President.
    (c) Presentation of Plaque and Past President's Pin to Retiring President.
15. **Report by:**
    (a) GOLDEN JUBILEE Convention General Chairman.
    (b) Industrial Finishing Exposition Chairman.
    (c) Fifth International Conference on Electrodeposition and Metal Finishing Chairman.
    (d) National Executive Secretary as to year-long GOLDEN JUBILEE observance and results.
16. **Reports by Future Convention Chairmen (Los Angeles, Boston, Milwaukee, Atlantic City).**
17. **Selection of Convention Cities—1964 and 1965.**
18. **Selection of Interim Meeting Site(s) and Setting of Date(s).**
19. **Resolution of Thanks to Detroit Branch, GOLDEN JUBILEE CONVENTION Host.**
20. **Adjournment of GOLDEN JUBILEE ANNUAL MEETING.**

EMPIRE STATE REGIONAL A GOLDEN JUBILEE SUCCESS

Members of the six AES Branches that comprise Empire State Regional—Buffalo, Capitol District, Mohawk Valley, Rochester, Southern Tier and Syracuse—assembled for the Regional's Fifth Annual Meeting at Buffalo's Hotel Stuyvesant on Saturday, April 11. It proved to be another fine annual meeting in this GOLDEN JUBILEE year of the AES.

Two educational sessions were held concurrently during the afternoon—one for electroplaters and the other for organic finishers. Frank Rudolph, president of the Buffalo Host Branch and general chairman of the meeting, opened the electroplating session and introduced the chairman, Harold Shapiro. Two informative papers were presented, "The Role of Stress in the Electrodeposition of Metals," by I. Laird Newell, president of Henry Souther Engineering Co., Hartford, Conn., and "Hard Chrome Plating," by Manuel Ben, supervisor of the plating service section, electrochemistry and polymers department, General Motors, Detroit, Mich.

John C. Scholterer, vice president of Buffalo Branch, welcomed the attendants at the Organic Finishing Session and introduced Chairman John Donaldson. Fremont L. Scott, research manager of the Organic Division, research and development department of Metal & Thermit Corp., Rahway, N. J., presented a paper on "Plastisols and Organosols as Protective and Decorative Coatings." Everett W. Linton, sales manager of Duralac Chemical Corp., Newark, N. J., spoke on "Multicolor Enamels." Both papers aroused keen interest.

At the conclusion of the separate meetings, a combined educational session was shown the Aluminum Co. of America's award winning film "Color and Texture in Aluminum Finishes."

The ladies program included a luncheon in the Peter Stuyvesant Room, followed by a demonstration of proper floral arrangements by an authority on flowers who has appeared on TV programs.

The banquet in the evening was enjoyed by 225 members, wives and guests. Prominently displayed in the Starlit Room were the AES GOLDEN ANNIVERSARY and Southern Tier 1960 Regional Meeting banners. General Chairman Frank Rudolph extended greetings and introduced the guests at the head table. David X. Clarin, Oakite Products, spoke briefly in a humorous vein and performed some magic. Educational Chairman Harold Shapiro requested Mrs. Fred D. Goeckel, chairman of the ladies committee, to draw for the door prize, a Sylvania radio. It was won by W. H. Moffatt of Rochester Branch.

Next year, Southern Tier Branch will be host to the Sixth Annual Empire State Regional at the Mark Twain Hotel in Elmira, April 29 and 30, 1960. Southern Tier President Stefanski personally invited everyone to attend this two-day Regional which he promised would be different, with an old fashioned barn dance in costume (even live animals), golf at the country club—and, of course, a topnotch technical session.

Dancing continued to the wee small hours.

(1) I. Laird Newell, left background, delivering his paper to the Empire State Regional Educational Session. (2) Attentive audience at the electroplating session. (3) One corner of the banquet room. (4) Floral demonstration at the Ladies Luncheon. (5) Members of the Ladies Committee.

(1) The Tri-State Region Committee confers. (2) A portion of the 125 plus who attended the impressive Educational Session. (3) The Tri-State ladies receive a charm demonstration. (4) Shenanigans at the Floor Show. (5) A view of a portion of the Golden Jubilee Banquet. (6) A view of the banquet dais. Left to right, E. L. Combs, Mrs. Combs, First Vice President Ralph D. Wysong, Mrs. Wysong, National President Herberth E. Head, Chairman K. C. Reifsteck, Mrs. Reifsteck, National Executive Secretary John P. Nichols, Mrs. Beyer, Branch President Stanley Beyer. (7) Chairman Reifsteck presents the coveted TV set to lovely winner.

TRI-STATE REGION STAGES A HIT GOLDEN JUBILEE EVENT IN LOUISVILLE

With the Louisville Branch as Host and charming Louisville as site, the energetic Tri-State Regional Group of the American Electroplaters' Society staged a GOLDEN JUBILEE Educational Session, Banquet and Dance at the Sheraton Hotel, Saturday, April 4 that stands out as among the finest of the AES's FIFTIETH ANNIVERSARY observance year.

Highspots were the educational session whose quality attracted and held an audience of over 125—a banquet that drew nearly 300 AES members, their families and guests—a cooperative reception by nearly 30 of the industry's suppliers that was a "before" and "after" banquet hit of the memorable event. Louisville's Kenneth Reifsteck served as General Chairman.

A luncheon by the Udylite Corporation started the day's festivities. Held in the Sheraton's Grand Ball Room, it featured the Tri-State debut of the Company's new VIP automatic plating machine.

The Educational Session launched the afternoon's program with an overflow audience present. Introduced by Branch President Stanley Beyer, one of that Branch's founding fathers, National President Herberth E. Head served as Chairman. The star-studded program featured three well-received papers. Dr. Henry Brown of Udylite presented, "Mechanism of Electrodeposition with Ni & Cr and the Corrosion Resistance of these Deposits." Eugene L. Combs of the Diamond Alkali Company discussed "Chromium Plating Up-To-Date," and James H. Peacock of the Duriron Company delivered his, "Metals and Plastics for Handling Plating Solutions."

Meantime, the ladies of the Tri-State were conducting their own fine event, namely a dessert luncheon followed by a talk on "What Every Woman Should Know About Charm" by Miss Eleonora of the Alix Adams Model Agency. The Program was conceived by Mrs. Kenneth Reifsteck aided by Edith Lamping, Mildred Beyer, Rosina Muscarella, Louvita Rembold and Ann Dawson as hostesses.

With the golden flag of the GOLDEN JUBILEE as dais backdrop and a packed Grand Ball Room, the banquet was highlighted by the drawing for a fine TV set that followed the brief talks of National President Head; First Vice President Ralph D. Wysong and National Executive Secretary John P. Nichols. Dynamic Chairman Reifsteck presided. Favors were a purse-size folding picture frame. Another credit for the event was its gold-colored printed progam. A fine floorshow was followed by dancing till midnight.

Each of the five Branches composing the Tri-State Regional were abundantly represented, namely Cincinnati, Columbus, Dayton and Indianapolis beside Host Louisville. Beside Louisville President Beyer and Chairman Reifsteck, the industrious committee included Al Russell and Jack Houston (Arrangement); Frank Lamping (Publicity); Joe Muscarella and Herb Rembold (Tickets) and Bill Dawson (Program). Al Russell headed the Entertainment Committee.

HOW SIX AES BRANCHES CONDUCT THEIR PLATING COURSES

Many AES Branches foster courses on electroplating and metal finishing. Such education, in addition to increasing the students' own knowledge, benefits the firms where they are employed and the entire industry in general. It also promotes greater interest in Branch membership.

PORTLAND

The Portland Branch, in cooperation with the Portland Extension Center of Oregon State System of higher Education, conducted a course on ten Monday evenings, from Feb. 2 to April 6, on Basic Industrial Chemistry. The topics covered included: Faraday's Law of Electrolysis—Brief Description of Ions, both simple and complex—Electrode Potentials—Polarization—Overvoltage—Electrode Efficiency—Corrosion—Throwing Power—Various Plating Baths and Conditions. Tuition was $15.

The course was designed to give a good background in the basic fundamentals of electrochemistry, as applied to the electroplating industry. The instructor was Dr. John R. Mickelsen of Portland State College. Twenty-seven students availed themselves of the course. Their backgrounds varied from no formal chemical education to masters in chemistry. Portland Branch plans to repeat the course next year as well as hold an advanced course for those who completed this year's instruction.

NEWARK

The 1958–1959 course in the basic fundamentals of practical electroplating, conducted by the Newark Branch, came to a successful close at the February meeting of the Branch, when framed diplomas were given to 33 graduates.

Once again, the course was designed to include a study of the fundamentals of electrochemistry, chemical calculations, power requirements, cleaning, pickling, plating, organic finishing, barrel finishing, purification and analysis. The lectures were given by men well versed in the phase of metal finishing being studied, and who were, for the most part, members of the Newark Branch. The classes were held weekly at various industrial plants and laboratories in the Greater Newark area. Thus the lectures were augmented by plant tours and demonstrations, enabling the student to obtain first hand knowledge of practicable metal finishing. In all cases, the student was introduced to new reference sources for answers to most finishing problems.

When the course started in November of 1958, the original intent of limiting the registration to 30 students had to be overlooked because of the demand for participation in the course. A total of 36 students started the semester, but only 33 received diplomas, two men dropped out, and one was suspended. The list included presidents of companies to plater's helpers, with an educational background that ranged from the college graduate to the grammar school level.

For the nominal fee of $20, the student received a copy of the Newark Branch Electroplating Course Manual," the "Metal Finishing Guide Book," and various pamphlets and technical literature of the industry. In addition, Graham's "Electroplating Engineering Handbook," Blum and Hogaboom's "Principles of Electroplating and Electroforming," and "Modern Electroplating," edited by Gray, were made available to the students at reduced cost.

The principal adjunct to the lecture was a homework assignment based on the evening's subject, and also included chemical calculations and practical problems that could be encountered during plant operations. The homework reviews were graded and returned to the students with corrections. Because of the wide variance in education, the graduating diplomas were not predicated solely on the marks received by the student. However, the average grade of the entire class was 85.3. Frank J. Eiden of Matchless Metal Polish, Glen Ridge, N. J., received the highest average grade of 99.3 per cent, and the lowest average grade was 64.5 per cent. The homework was designed to enable the student to utilize the Manual, Guidebook, and handbooks as reference material. He thus learned one of the most important aspects of this or any other course, i.e., where to look for help in solving daily plating or finishing problems.

The "Newark Branch Electroplating Course Manual," which had been revised earlier in 1958, contained the lectures of most of the instructors in "question and answer" form. It is now being considered for another revision to include other topics not previously covered.

The development and improvement of plating techniques is an essential need in today's plating operations, and the sustained interest shown each year in the Newark Branch's educational program affords ample incentive to the Course Committee to continually help foster the dissemination of knowledge to its members. The attentiveness of the students during the lectures and subsequent question and answer period was indicative of this need to "know how," and showed the value of such a course. The Newark Branch is indeed fortunate to be able to conduct this type of plant visitation course in an area abounding in plating shops. The list of speakers who participated in the course include nationally known men who are accomplished speakers and leaders in their field. All served willingly and enthusiastically in this Branch function. The companies that participated generously provided refreshments after each class, when the informal "bull sessions" were a prime source of information and discussion of problems.

As an aftermath of the course, the Branch benefitted by an appreciable number of new members. The advantages of membership were frequently expounded upon during the span of the course, and the students were apprised of the various articles appearing in PLATING and other publications, as they pertained to electroplating, and of their value as more reference material.

As chairman of the 1958–1959 Electroplating Course Committee, the writer gratefully acknowledges the services of John Banta, Gus Bittrich, Robert Ehrhardt, Robert Horrocks, and Al Korbelak in the planning and conducting of this course. The Committee also thanks each speaker and the participating companies for the hours of preparation that went into the presentation of each session.

F. J. LA MANNA

PHILADELPHIA

A course on the Principles and Practices of Electroplating is given under the auspices of Philadelphia Branch at Temple University Technical Institute. It is directed by Dr. Samuel Heiman.

Its objective is to provide electroplating personnel with a sound understanding of the principles of electrodeposition and to apply these principles to electroplating practice.

In each semester, there is at least one plant visit to a plating department in the area. A Certificate of Proficiency is awarded to students who satisfactorily complete this program.

The entire course covers three semesters' work. A student may start the course in any term.

The lecture covers the following:

1. Preparation of metals for plating:
   Cleaning, pickling, hydrogen embrittlement, inhibitors, bright dipping.
2. Various plating and metal finishing processes:
   These include copper, nickel, chromium, zinc, cadmium, lead, tin, brass, silver, gold, and others. The metal finishing processes discussed include anodizing, phosphating, chromate conversion coatings, electropolishing, aluminum and magnesium treatments, polishing and buffing, barrel plating, plating on plastics, electroforming, and plating on aluminum.
   The discussion includes the history, industrial applications, solution com-

Electroplating class of the Newark Branch. (Left) This session was held at the laboratory of Oakite Products in New York City. (Right) Gerald Lux of Oakite lecturing to the class.

positions, operating conditions, maintenance and control, purification and calculations.

3. Theoretical basis for electroplating: Elements of electricity and electrochemistry, Faraday's Laws, throwing power, and polarization.
4. Properties and Testing of Electrodeposits: Testing for thickness, porosity, adhesion, stress, and corrosion resistance. Structure and character of deposits, specifications, identification of deposits, stripping of coatings.
5. Electroplating Engineering: Plating room equipment, electrical equipment such as generators, rectifiers, and rheostats.
6. Selected Topics: Sources of impurities and purification of electroplating solutions, rinsing, corrosion theory.

The laboratory work in the first semester is devoted to the analysis of the constituents of plating solutions; in the second and third semesters it includes experiments illustrating many of the lecture topics.

The laboratory is equipped with rectifiers, *p*H meters, Hull and Haring cells, thickness testing instruments, analytical equipment and all necessary materials and chemicals. Henry Fenster teaches the laboratory.

The tuition is $36 plus a $5 laboratory fee, totaling $41 per semester.

NEW HAVEN

"Electroplating" is a non-credit course conducted by the Special Course Section of New Haven College, New Haven, Conn. under the sponsorship of the New Haven Branch of the AES. The course is designed primarily to meet the needs of those people now engaged in the metal finishing industry who wish to enlarge their knowledge of the field.

The schedule is kept flexible and the amount of time spent on each subject depends on the interest shown by the class members.

Students may start the course at the beginning of any session with the following exception. Students without any background in chemistry must take "Chemistry for Electroplating" to be admitted to the "Electroplating Solutions" session.

Edward F. Foley Jr., librarian of the New Haven Branch, is the instructor. The course is comprised of four 15-week sessions and the tuition is $50 a session. The course is held on Monday evenings, 7:15 to 9:30 p.m. The four sessions are: 1) Fundamentals of Electroplating, 2) Chemistry for Electroplating, 3) Electroplating Solutions, 4) Electroplating Practice.

The course is also designed to provide some knowledge of the chemical nature of the metals and reagents encountered in the plating industry to serve as a basis for interpreting some of the phenoma which may be met in common plating practice problems.

MONTREAL

The first year of the course on electroplating sponsored by Montreal Branch will hold final sessions on May 6, it started last Nov. 26. This new course was conceived by Philip M. Coady and Dr. John Kane, who interested the Polytechnique Institute in providing the lectures.

The course is given in both french and english, one week in french and the same lecture the following week in english. It is conducted by Dr. Andre Honé, professor of Metallurgy at the École Polytechnique. The fee is $50 per year. This year there are 42 students, evenly split between the dual language classes.

The course is planned to cover three years of study. The first year deals with Basic Electrochemistry, the second year with Practical Electroplating, and the third year with Control in Electroplating. Montreal is taking a purely academic view in the first year course with the idea of instilling the basic academic principles of chemistry and electrochemistry.

The first year subjects are: 1) Types of applications; 2) Structure of the atom; 3) Binding forces, compounds; 4) Dissociation, ionization, *p*H, indicators; 5) Reactions at the anode and at the cathode; ion transport; 6) Mechanism of plating; 7) Electromotive force, polarization, depolarization; 8) Electricity, voltage, power, energy; 9) Corrosion—its mechanism. The two types of corrosion. The three fundamental methods of keeping corrosion under control. 10) Surface chemistry, cleaning and pickling, ultra-sonics; 11) Metallurgy of deposits, multi-layer deposits; 12) Special processes: oxidation, passivation, non-metallic deposition, electropolishing, deplating, organic solutions

At the end of each lecture, each student receives a summary of the following lecture and a series of exercises pertaining to it.

The students familiarize themselves with the subject by reading the summary, by discussions with people who are conversant with the subject, and by reading periodicals and books

The students answer the questions and write them on two copies of the exercise sheets A real effort is urged to complete the exercise sheets, because the questions bear on the most important facts of the lectures.

Upon arriving at a lecture, the students hand out one copy of the completed exercise sheets. These copies are graded, marks are recorded and the copies are kept on file by the school.

MILWAUKEE

The course which began on Jan. 7 was promoted between the Milwaukee Branch and the Racine Vocational Adult School. Three instructors are regular staff members of the Racine Vocational School system. The balance of instructors are all members of different branches of the AES and offered their services free of charge.

Thirty-four men enrolled in the school from seven plating concerns, five manufacturing concerns and three suppliers. The fee was $5 for the ten sessions which concluded on March 11.

The lowest attendance at any of the sessions was twenty-five, and twenty-nine out of the thirty-four enrolled will receive certificates because they attended eight or more sessions.

Every session this year proved interesting and instructive, and those taking part in promoting this school are to be congratulated on a job very well done Future courses in electroplating will be planned after a complete analysis of information compiled from this present course.

Subjects covered were: Principles of Chemistry, Principles of Chemical Analysis, Principles of Electricity and Electrochemistry, Factors Governing the Character of the Deposits, Preparation for Electroplating, Electrical and Plating Equipment, Tests and Inspection—Solutions, Materials and Equipment; Plating Problems and New Developments.

RODNEY H. OLSEN
Coordinator for Milwaukee Branch

Donald M. Bigge

MEET MR. PRESIDENT

THE Detroit Branch's recently elected president, D. M. Bigge, became managing engineer, Chemical Engineering Laboratories, Engineering Division of the Chrysler Corporation in 1951.

Prior appointments were assistant head, Materials Testing Laboratory in 1946, project engineer on applications of aluminum alloys for automotive parts in 1944, chief metallurgist, Chrysler Evansville Ordnance in 1942. He entered the automobile industry when he joined Chrysler Corporation in 1940 as a metallurgist.

He is a graduate of University of Detroit, College of Engineering receiving degrees of Bachelor of Chemical Engineering in 1928 and Master of Science in 1929.

He is secretary of ASTM, Committee B-8, on Electrodeposited Metallic Coatings, is chairman of Society of Automotive Engineers Subcommittee on Electroplating, is a member of American Electroplaters' Society Project 15 Committee, has been on Board of Managers, second vice president and first vice president of the Detroit Branch of the American Electroplaters' Society. He has been a member of the Board of Directors of the Kresge-Hooker Science Library, Wayne State University, since 1951.

He was born in Filer City, Michigan, December 14, 1904. He is married and has two daughters, Barbara, who has graduated from Indiana University in speech and theatre, and Katherine, now in her Junior Year at Indiana University in the school of speech and theatre.

He lives in Bloomfield Hills, Michigan. His recreational activities are golf, fishing, hunting, music and photography.

AES EXTENDS COMMENDATION TO RETIRING COMMITTEE MEMBERS

The following are the Society's stalwarts whose terms on AES Standing Boards and Committees expire at the First Business Session of the Supreme Society to be held at the GOLDEN JUBILEE CONVENTION in Detroit, Monday, June 15, 1959.

EDITORIAL BOARD:
Dr. Abner Brenner, S. Lewis Doughty, William M. Tucker

EDUCATIONAL COMMITTEE:
Myron Ceresa, Ralph M. McCahan, Dr. Ernest J. Wilhelm

HONORARY MEMBERSHIP AWARD COMMITTEE:
Louis V. Gagnon, Kenneth M. Huston

MEMBERSHIP COMMITTEE:
Robert L. Garrett, John J. Bunsic, George W. Taylor

PUBLICATIONS COMMITTEE:
Dr. D. Gardner Foulke, Dr. R. B. Saltonstall, Dr. Henry Leidheiser Jr.

PUBLIC RELATIONS COMMITTEE:
Robert C. Trees, Manson Glover, Robert M. Norton

RESEARCH COMMITTEE:
Leslie L. Diveley, Dr. Russel E. Harr, Leland M. Morse

SCIENTIFIC ACHIEVEMENT AWARD COMMITTEE:
Dr. Samuel Heiman, Dr. Edward A. Parker

The Society extends its deep appreciation to each of these members for meritorious service during his tenure. PLATING MAGAZINE adds its own congratulations.

GOLDEN JUBILEE CONVENTION TO HEAR NOTED MICHIGAN INDUSTRIALIST

Irving A. Duffy, Vice President of the Body Group of the Ford Motor Company, has accepted AES's invitation and will deliver the principal address at the Grand Opening Session of the GOLDEN JUBILEE Convention to be held in the Grand Ballroom of the Statler-Hilton Hotel, Detroit, Monday, June 15, 1959 starting at 10 a.m.

Mr. Duffy joined Ford in 1949 as purchasing director and was named a vice president in December of the same year. In January, 1953, he was elected to the Board of Directors. Becoming general manager of the Tractor and Implement Division in January, 1954, he was made vice president over four manufacturing divisions in January 1957 and was appointed vice president of the Body Group when it was formed in April, 1958. This group includes the Metal Stamping, Hardware and Accessories, Steel and Glass divisions and Manufacturing Services activities. He also directs the Tractor and Implement Division.

Mr. Duffy was born in Chicago in 1904 and entered the U. S. Military Academy at West Point in 1922, and upon graduation was ordered to duty with the Cavalry. In 1928, he entered the Columbia University law school and two years later, joined the faculty at West Point as an instructor in law.

In 1940, Mr. Duffy was assigned to the Army Ordnance Department, where he helped establish large special-purpose ordnance plants. In this three billion dollar program, he was concerned directly with purchasing and procurement policies that later became models for other Army branches and services. He also played an active part in the cooperation between Army ordnance and American industry in World War II, during which he served as chief of the Legal Division of the Ordnance Department and as special assistant to the Chief of Ordnance. He retired from the Army in 1946 with the rank of Colonel. In September, 1953, he was appointed by the Secretary of the Army to serve on the advisory committee on Army organizations.

Irving A. Duffy

ONE of the AES's earliest chartered Branches and today its largest—Host Branch of four prior Annual AES Conventions and pioneer of the Society's Industrial Finishing Expositions—the Detroit Branch deems it a privilege and an honor to serve as Host of the GOLDEN JUBILEE Convention and Industrial Finishing Exposition that, with the Fifth International Conference on Electrodeposition and Metal Finishing, will be held in our City, June 15–19, 1959.

Four years of planning and effort have been exerted by the Branch to make these climax events of our Society's FIFTIETH ANNIVERSARY observance effective and resultful. May each of you of AES enjoy and be benefited by every moment spent in our City that eventful week.

MANUEL BEN
Retiring President
AES Detroit Branch

AES BOARD AND COMMITTEE MEETINGS AT GOLDEN JUBILEE CONVENTION DETROIT, MICHIGAN

SUNDAY, JUNE 14			
9 a.m.	Executive Board	B	Herberth E. Head
4 p.m.	Credentials Committee	B	Cleveland F. Nixon
4 p.m.	Scientific Achievement Award Committee	F	Dr. Abner Brenner
MONDAY, JUNE 15			
12 p.m.	Branch Secretaries	English	John P. Nichols
3 p.m.	Editorial Board	E	John P. Nichols
4:30 p.m.	Order of Past Presidents	F	Samuel S. Johnson
TUESDAY, JUNE 16			
9 a.m.	Research Committee	F	Dr. Russel E. Harr
9 a.m.	Educational Committee	E	Dr. Dodd S. Carr
12 p.m.	Branch Librarians	English	Ralph D. Wysong
WEDNESDAY, JUNE 17			
9 a.m.	Membership Committee	F	Manuel Ben
9 a.m.	Public Relations Committee	English	Frank Tirendi
9 a.m.	Midwest Regional Council	B	Leslie L. Diveley
1 p.m.	Publications Committee	B	Dr. Samuel Heiman
FRIDAY, JUNE 19			
9 a.m.	Executive Board	B	New President

FUN FOR AES CHILDREN AT THE GOLDEN JUBILEE CONVENTION

Though there will be no formal Children's Program at the GOLDEN JUBILEE CONVENTION, there will be abundant opportunity for fun and enjoyment for AES children.

Children who wish to participate in either the Men's or Ladies' Program may do so with their parents. They must, however, purchase a registration book which is priced at twenty dollars ($20.00).

The actual cost of the "S.S. Aquarama" cruise, the visit to Greenfield Village; the Outing and other such events is approximately 50 per cent more than the registration fee charged.

PLATING'S GOLDEN JUBILEE ISSUE WILL INCLUDE "KALEIDOSCOPE OF AES's FIRST HALF-CENTURY"

INDUSTRIAL FINISHING EXPOSITION EXHIBITORS RECEIVE SHOW KITS

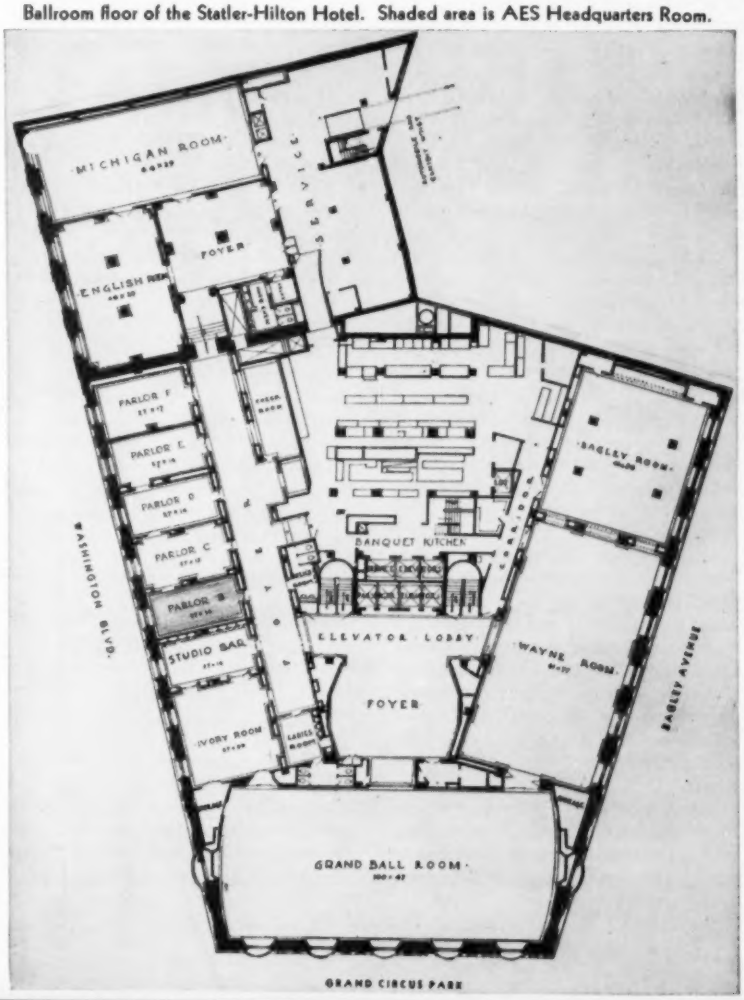
From Howard J. McAleer, AES Exposition Chairman, every exhibitor who has contracted for space at the GOLDEN JUBILEE Exposition has now received a SHOW KIT containing information on and order forms for the various services that will be available to exhibitors at the show together with other basic information.

AES's Show Management will open an office at the Armory on Monday, June 8. Show Manager Marvin C. Johnson, with a capable assistant who will act as Floor Manager, will be available at that location for any service that he may render to any exhibitor.

The telephone numbers of the Show Office will be LIncoln 8-3232 and LIncoln 8-3233. The phones will be listed with "Information" under AES Fifth Industrial Finishing Exposition.

Exhibits can begin moving into the Artillery Armory, according to Mr. McAleer, at 8:00 a.m. Monday, June 8. All exhibits must be erected and completed by 8:00 a.m. Tuesday, June 16.

Ballroom floor of the Statler-Hilton Hotel. Shaded area is AES Headquarters Room.



PINNER SETS 25-YEAR RECORD AS MILWAUKEE BRANCH SPEAKER

At its June 3 meeting, Milwaukee Branch will honor Walter L. Pinner on the occasion of his twenty-fifth consecutive annual visit to that Branch.

Mr. Pinner's first visit to Milwaukee Branch was in the year 1934. The Branch then held its meetings at Lipp's Hall. Dr. Baker and John Anglim, chief metallurgist (now retired) of Nash Motors, Kenosha, Wisconsin accompanied Mr. Pinner on that occasion.

For the next 15 years Walter Pinner presented papers, sometimes at Milwaukee's annual meetings and other years at the regular Friday evening Branch meetings.

In 1949, Glen A. Schwemer was asked to be chairman of the first "Pinner Meeting." It was held at the Ambassador Hotel and was preceded by a dinner which was attended by as many members as desired to go. This was the beginning of what has now been known for many years as the annual Pinner Dinner. These annual dinners have been held at the Ambassador Hotel, North Hills Country Club, Milwaukee Elks Club and Pabst Blue Ribbon Hall. On the occasion of his twentieth annual visit in 1954, the Pinner Dinner was held at the Milwaukee Elks Club and the guest of honor was presented with the gift of an overnight case.

Eight years ago, Mr. Schwemer was instrumental in obtaining Pabst Blue Ribbon Hall for one meeting a year. The meeting was held for the first few years in the month of March. The Pabst Brewing Co. furnished the hall and the beer, and saw to it that the members were made comfortable. The meeting was preceded by a buffet lunch which the Wisconsin Job Platers made possible by their contributions. About four years ago, the date of the "Pabst Meeting" was changed to the first week in June. This was done to bolster the rather poor attendance at the last meeting of the season and also to wind up the season with a memorable meeting of fun and good fellowship—as well as business. This meeting has now become the most popular of all the year s meetings and is attended by more members than any other.

Three years ago, the Pabst Blue Ribbon Meeting was combined with the Pinner Dinner, as it will be this year. Milwaukee Branch has decided to "ease up" on Pinner this year and not ask him to give a technical paper. Instead, he will give an abbreviated preview of the International Conference in his capacity of chairman of the International Council, and then take his audience on a color slide trip to Arizona.

Another speaker on the program will be Judge William I. O'Neill of Milwaukee, who has appeared on several other Pinner Dinner programs in previous years.

Glen Schwemer has commented, "I feel that it has been a great privilege to have been chairman of the annual Pinner Dinner for the past ten years, and especially on this twenty-fifth anniversary of his visits."

After 35 years with Houdaille Industries, Mr. Pinner is now manager of electroplating development for The McGean Chemical Co. He is a past National President of the AES and is Project Chairman of AES Research Project No. 15.

LOS ANGELES BRANCH STAGES IMPRESSIVE GOLDEN JUBILEE CELEBRATION

by Don W. Baudrand and Lawrence Henderson

The GOLDEN JUBILEE of the American Electroplaters' Society was given spectacular prominence at Los Angeles Branch's Twenty-ninth Annual Educational Session and Dinner-Dance held March 21 at the Beverly Hilton Hotel in Beverly Hills, Calif.

As members and guests entered the hotel's Nordic Room where the technical session had been held from 9:30 a.m. until 12:30 p.m., they were confronted by a 40-foot banner of golden cloth strung along the full length of the wall behind the speaker's table. In foot-high letters the message on the banner read: AES GOLDEN ANNIVERSARY—DETROIT, MICH., JUNE 15–19, 1959.

The GOLDEN ANNIVERSARY theme was again emphasized in the form of the GOLDEN JUBILEE emblem embossed in gold and blue on the dinner-dance program.

The program followed the pattern of previous years. It consisted of one continuous technical session, at which two local and one midwestern speaker appeared, a noon-day luncheon keyed to a sports theme, and the annual dinner-dance and floor show in the evening.

Harvey K. Hunt, the Branch's 1958–59 librarian and secretary-elect, offered a brief review of AES history before introducing the first speaker. In a capsuled but fact-packed report, he traced the Society's progress from its founding by a small group of New York area platers in 1909, to its stature in 1959, with 58 branches in the United States, Canada and Australia which have approximately 8000 men and women on their membership rolls.

The speakers who addressed the technical session, and their subjects, were: Dr. Samuel Spring, Kelite Corp., Los Angeles, on "Alkaline Cleaners"; Dr. M. M. Beckwith, Harshaw Chemical Co., Cleveland, on "Bright Nickel Plating"; and Bernard Goldwasser, Convair Astronautics, Pomona, Calif., on "Printed Circuit Plating". A lively question-and-answer period followed each of the talks.

At 1 p.m., 125 members and guests assembled for luncheon in the Cadora Room, where the inimitable Irish wit of Toastmaster Larry O'Neil was displayed in its richest Hibernian flavor. Earl Coffin, a Charter Member, was called upon to give a brief report of the history of the Branch and responded with a historical review that carried back to the Branch's founding days in 1930. Another Charter Member present was Don Bedwell.

The dinner and dance in the International Room were preceded by a reception from 6:30 to 8 p.m. The committee on arrangements, headed by Larry Henderson, presented what most of those present described as the finest and most elaborate entertainment ever offered at a Los Angeles Branch affair. The feature was a top-flight ice show on colored ice. The seating arrangement in the ballroom, in which the tables are placed on rising tiers, permitted all present to have an excellent view of the performers.

John Millhorn, who originated the Waltz Contest during his tenure as Branch president a half-dozen years ago, again presided over a dozen or so waltzing couples who strove for the grand prize—a loving cup.

Attendance at the dinner-dance was in excess of 600, a tribute to the hard work of the arrangements committee, which included: Larry Henderson (general chairman), John Millhorn, Harvey Hunt, Larry O'Neil, William Thomas, Frank Virgil, Harold Wanamaker, Clare Verwest, Ozzie Grissat, Jack Schultz, Norman Painter, Vonna Ott and Claude Weekly.

LOS ANGELES CONVENTION DATES CHANGED TO JULY 24-28, 1960

At its meeting held in Washington, D. C., Friday, April 10, 1959, the Executive Board approved the request of the Los Angeles Branch Convention Committee and altered the dates of AES's 1960 National Convention from July 10–14, 1960 to July 24–28, 1960.

The modification was made necessary by the fact of the recent selection of Los Angeles as National Convention site of the Democratic Party to occur during the July 10–14 week. By making the change as suggested, the Board concurred with the view of the Los Angeles Branch that AES " . . . Conventioneers will be able to enjoy their visit to the West Coast a little better . . . you can well imagine how crowded this town is going to be with 20,000 politicians using up all the available hotel rooms, taxi cabs, buses, etc. . . . "

GRAND CIRCUS PARK

PROGRAM

GOLDEN JUBILEE CONVENTION AND INDUSTRIAL FINISHING EXPOSITION
AMERICAN ELECTROPLATERS' SOCIETY, INC.

HOTEL STATLER-HILTON, DETROIT, AND ARTILLERY ARMORY, OAK PARK, JUNE 15–19, 1959

SUNDAY, JUNE 14

9:00 a.m.	Executive Board Meeting (All Day)	Hq. Room (Parlor B)
1:00–8:00 p.m.	Convention Registration	Foyer
3:00–5:00 p.m.	Ladies Tea (Sponsored by Siefen Compounds, Inc.)	English Room
4:00 p.m.	Credentials Committee Meeting	Parlor B
4:00 p.m.	AES Scientific Achievement Award Committee Meeting	Parlor F
8:00 p.m.	Golden Jubilee Get-Together Party	Grand Ballroom

MONDAY, JUNE 15

8:30 a.m.– 5:30 p.m.	Convention Registration	Foyer
10:00 a.m.	Grand Opening, Golden Jubilee Convention	Grand Ballroom
	CALL TO ORDER: Wright W. Wilson, General Chairman	
	INVOCATION: Rev. Canon Irwin C. Johnson, St. John's Episcopal Church	
	DETROIT'S WELCOME: Hon. Louis C. Miriani, Mayor of Detroit	
	AES RESPONSE: National President Herberth E. Head	
	MICHIGAN'S GREETINGS: Hon. G. Mennen Williams, Governor of Michigan	
	AWARDS: Announcement of winner Scientific Achievement Award by Dr. Abner Brenner, Chairman, Selection Committee	
	KEYNOTE ADDRESS: Irving A. Duffy, Vice President, Ford Motor Co.	
11:00 a.m.	Business Meeting, Supreme Society	Grand Ballroom
12:00 noon	Branch Secretaries' Luncheon	English Room
12:00 noon	Speakers' Luncheon	Parlor E
12:00 noon	Ladies Program. Luncheon at Detroit Yacht Club (Co-sponsored by Allied Research Products, Inc., and Pillsbury Chemicals). Special Entertainment	Bus from Statler-Hilton
1:00–5:00 p.m.	Convention Registration	Artillery Armory
2:00 p.m.	Opening Educational Session A, Fifth International Conference on Electrodeposition and Metal Finishing	Grand Ballroom
3:00 p.m.	Editorial Board Meeting	Parlor E
4:30 p.m.	Order of Past Presidents, Business Meeting	Parlor F
6:30 p.m.	Past Presidents' Dinner	English Room
8:00 p.m.	AES Golden Jubilee Open House (Sponsored by Metal Finishing Suppliers' Association) Crystal, Grand and Founders Ballrooms	Sheraton-Cadillac

TUESDAY, JUNE 16

8:00 a.m.	Research Committee Breakfast	Parlor F
8:00 a.m.	Speakers' Breakfast	Parlor C
8:30 a.m.–1 p.m.	Convention Registration	Foyer
9:00 a.m.	Educational Session B, International Conference	Grand Ballroom
9:00 a.m.	Educational Session C, International Conference	Michigan Room
9:00 a.m.	Research Committee Meeting	Parlor F
9:00 a.m.	Educational Committee Meeting	Parlor E
9:30 a.m.	Plant Visit, Ford Motor Company (Rouge Plant), Dearborn, Michigan	Bus from Statler-Hilton
10:00 a.m.–5:00 p.m.	Convention Registration	Artillery Armory
10:00 a.m.–9:00 p.m.	Industrial Finishing Exposition	Artillery Armory
11:00 a.m.	Ladies Program. Trip to Dearborn Inn—Luncheon and Entertainment (Sponsored by Oakite Products, Inc.), followed by Tour of Edison Institute and Greenfield Village	Bus from Statler-Hilton
12:00 noon	Branch Librarians' and Educational Committee Luncheon	English Room
12:00 noon	Speakers' Luncheon	Parlor C
2:00 p.m.	Opening Ceremony, Fifth Industrial Finishing Exposition	Artillery Armory
2:00 p.m.	Research Committee Meeting	Parlor F
2:30 p.m.	Educational Session D, International Conference	Artillery Armory

WEDNESDAY, JUNE 17

8:00 a.m.	Membership Committee Breakfast	Parlor F
8:00 a.m.	Speakers' Breakfast	Parlor E
8:30 a.m.–1 p.m.	Convention Registration	Foyer
8:30 a.m.	Golden Jubilee Golf Tournament (Sponsored by MFSA)	Pine Lake Country Club, Pontiac
8:45 a.m.	Ladies Program. Lake St. Clair Cruise on the S.S. Aquarama (Luncheon) (Co-sponsored by J. J. Siefen Co. and Northwest Chemical Co.)	Cabs from Statler-Hilton
9:00 a.m.–12:00 noon	Registration	Foyer
9:00 a.m.	Public Relations Committee Meeting	English Room
9:00 a.m.	Membership Committee Meeting	Parlor F
9:00 a.m.	Midwest Regional Council Meeting	Parlor B
9:00 a.m.	Educational Session E, International Conference	Grand Ballroom
9:00 a.m.	Educational Session F, International Conference	Michigan Room
9:30 a.m.	Plant Visit, Chrysler Engineering Laboratory	Bus from Statler-Hilton
10:00 a.m.–5:00 p.m.	Convention Registration	Artillery Armory
10:00 a.m.–9:00 p.m.	Industrial Finishing Exposition	Artillery Armory
1:00 p.m.	Publications Committee Meeting	Parlor B
2:00 p.m.	East-West GOLDEN JUBILEE Championship Baseball Game	Artillery Armory Grounds
4:00 p.m.	Golden Jubilee Outing (Millionaire's Party, followed by Barbecue)	Artillery Armory Grounds

(Continued on the next page)

(Program Continued From Previous Page)

AES GOLDEN JUBILEE CONVENTION AND INDUSTRIAL FINISHING EXPOSITION

THURSDAY, JUNE 18

8:00 a.m.	Speakers' Breakfast	Parlor F
8:30 a.m.–1 p.m.	Convention Registration	Foyer
9:00 a.m.	Business Meeting, Supreme Society	Wayne Room
9:00 a.m.	Educational Session G, International Conference	Grand Ballroom
9:00 a.m.	Plant Visit, General Motors Technical Center, Warren, Michigan	Bus from Statler-Hilton
10:00 a.m.–4:00 p.m.	Industrial Finishing Exposition	Artillery Armory
11:00 a.m.	Ladies Program. Brunch at Devon Gables, Bloomfield Hills (Sponsored by The Udylite Corp.) followed by Auto Styling Show at Chrysler Corporation and Tea	Bus to Chrysler from Statler-Hilton
12:00 noon	Speakers' Luncheon	Parlor F
2:00 p.m.	Business Meeting, Supreme Society	Wayne Room
2:30 p.m.	Educational Session H, International Conference	Grand Ballroom
7:00 p.m.	Golden Jubilee Banquet, Floor Show and Dance	Statler-Hilton

FRIDAY, JUNE 19

8:00 a.m.	President's Breakfast (National Officers and Wives)	President's Suite
8:00 a.m.	Speakers' Breakfast	Parlor F
8:30 a.m.	Ladies Program. Ford Motor Company Tour and Luncheon	Bus from Statler-Hilton
9:00 a.m.	Executive Board Meeting	Parlor B
9:00 a.m.	Educational Session I, International Conference	Michigan Room
9:00 a.m.	Educational Session J, International Conference	Grand Ballroom
10:00 a.m.–6:00 p.m.	Industrial Finishing Exposition	Artillery Armory
12:00 noon	Speakers' Luncheon	Parlor F
2:30 p.m.	Educational Session K, International Conference	Artillery Armory

SESSION A

Dr. T. P. Hoar
England

SESSION B

G. Ross Davidson
Canada

SESSION C

Leslie L. Diveley
United States

SESSION D

William M. Phillips
United States

SESSION E

Clarence H. Sample
United States

SESSION F

Ralph D. Wysong
United States

SESSIONS CHAIRMEN
FIFTH INTERNATIONAL CONFERENCE
ON
ELECTRODEPOSITION AND METAL FINISHING

SESSION G

Dr. S. Wernick
England

SESSION H

Ezra A. Blount
United States

SESSION I

A. W. Wallbank
England

SESSION J

A. A. B. Harvey
England

SESSION K

Dr. Abner Brenner
United States

PROGRAM

INTERNATIONAL CONFERENCE

on

ELECTRODEPOSITION AND METAL FINISHING

THE EDUCATIONAL SESSIONS PHASE OF

GOLDEN JUBILEE CONVENTION, AMERICAN ELECTROPLATERS' SOCIETY

HOTEL STATLER-HILTON, DETROIT, and ARTILLERY ARMORY, OAK PARK, MICHIGAN

JUNE 15-19, 1959

MONDAY, JUNE 15

2:00 p.m. Educational Session ..... Grand Ballroom

SESSION A

Chairman—Dr. T. P. Hoar, *England*

THE WILLIAM BLUM LECTURE—EDUCATION AND THE ELECTROPLATING INDUSTRY
by Dr. William Blum, *United States*

The electroplating industry should prepare to take its proper place in our complex civilization, and to meet the challenge of the space age. To do so it is necessary to educate not only apprentices and foreman platers, but also works chemists, research chemists, plant executives, design engineers, and the general public who purchase plated products. Channels for such education are suggested.

PROBLEMS ENCOUNTERED IN THE APPLICATION OF PRE-FINISHED METAL
by Dr. S. Wernick, *England*

The general advantage, cost reduction and value to industry accruing from the use of pre-finished metal are indicated. Problems involved in using such material, arising from the nature and properties of the coating, are discussed. Stress is laid on the fact that pre-finished metal represents a challenge to the Industry which can only be met by improvement in the quality of metal finishes.

DEVELOPMENT AND APPLICATION OF ULTRASONIC CLEANING
by J. Zucker, *Switzerland*

EXPERIMENTAL STUDIES OF THE ELECTRODEPOSITION OF METALS IN NARROW CREVICES
by Dr. Henry Leidheiser Jr. and Mrs. Lucille B. Garmon, *United States*

This paper represents the first progress report of AES Research Project No. 17. It describes and summarizes results of experiments to determine the important variables which influence the distribution of an electrodeposit on a micro scale. Selected experimental results are reported on cobalt, copper, iron, nickel, silver, and zinc baths, and on tin-nickel alloy baths, although the majority of the experimental work has been with various nickel baths.

TUESDAY, JUNE 16

9:00 a.m. Educational Session ..... Grand Ballroom

SESSION B

Chairman—G. Ross Davidson, *Canada*

A BLACK CHROMIUM PLATING PROCESS
by Dr. A. Kenneth Graham, *United States*

A black chromium plating process has been developed which may be operated over a relatively low current density range of about 150 to over 450 asf, at temperatures from 70 to 100F, with cathode efficiencies from about 6 to 15 per cent. Uniformly deep black deposits result. Coating thickness can be varied as desired and its wear resistance is 2.5 to 3 times that of bright nickel. The coating is readily wettable with either oil or water and may find application as a substitute for hard or porous chromium. For decorative applications oil, wax or organic supplemental coatings may be applied to improve the luster. The protective value of the coating may be varied with or without supplemental coatings. The coating may be applied to any basis metal that can be readily plated.

LEVELING POWER OF COPPER SULFATE BATHS WITH COMPLEXING ADDITION AGENTS
by Dr. Eugenio Bertorelle, Dr. I. R. Bellobono and Dr. A. Scarati, *Italy*

Leveling power in an acid copper electrolyte consisting in a 0.5 Molar solution of $CuSO_4.5H_2O$ and 0.25 Molar solution of H_2SO_4, was examined in the presence of organic addition agents, able to form complexes of different stability with cupric ions. In most cases a field oriented growth was observed. The leveling power was evaluated by means of a standard "pseudosinusoidal" microprofile, with an amplitude of 50 microns, performing several metallographic measurements after various electroplating times.

PLATING ZINC ON STEEL FROM PYROPHOSPHATE SOLUTION—A PILOT PLANT INVESTIGATION
by U. F. Marx and D. Povey, *England*

A pilot plant investigation of the electrodeposition of zinc on steel from zinc pyrophosphate solution is described. The optimum operating conditions and the effects of departing from

them are reported. Data for electrode polarization, throwing power, hardness, structure and corrosion resistance of the deposits are recorded and compared with those for a zinc cyanide solution. While no firm conclusion can be reached about the relative operating costs of pyrophosphate and cyanide solutions, it appears that when all factors, including effluent disposal, are taken into consideration, the comparison will favor the pyrophosphate solution.

ELECTRODEPOSITION OF NICKEL ALLOYS FROM THE PYROPHOSPHATE BATH

by Dr. T. L. Rama Char, *India*

A detailed study has been made of the effect of variables on cathode efficiency, cathode potential, and composition of alloy deposits of nickel with tin, copper, zinc, cobalt and iron from the complex pyrophosphate bath. A wide range of alloy composition is possible. In the nickel-zinc system sudden changes occur in plate composition and cathode potential at low current density. At higher current densities the deposit composition was practically constant except with nickel-copper. Preliminary work has indicated possibilities of depositing alloys of nickel with manganese, tungsten and molybdenum from this bath.

9:00 a.m. Educational Session ..... **Michigan Room**

SESSION C

Chairman—Leslie L. Diveley, *United States*

CHEMICAL CONVERSION COATINGS

by Robert F. Ayres, *United States*

Various types of chemical conversion coatings, including oxides, phosphates and chromates, are defined, described and compared, and the distinction between deposits on the surface and conversion of the surface is illustrated. Experiments are reported relative to oxide components and co-precipitants in phosphate coatings, as well as the formation of stable chromium conversion coatings, and explanatory theories are discussed.

THE METAL SURFACE CONVERSION COATING AS A PAINT BASE

by Dr. Robert C. Gibson, *United States*

The value of phosphate, chromate and oxide coatings, singly or mixed as bases for organic coatings on steel, zinc and aluminum surfaces is widely recognized. This paper discusses the manner in which these coatings perform their intended function and the preparation of the basis metals, and theory of the mechanism of formation of phosphate coatings. Importance of processing details with respect to performance of the coatings is also emphasized. A treatment which forms an amorphous oxide-chromate type of coating on aluminum and its alloys makes the surface receptive to paints.

THE ACCELERATED WEATHERING OF ORGANIC FINISHES

by A. A. B. Harvey, *England*

Accelerated weathering cycles consist of exposure to light, heat, moisture and corrosive vapors, separately and in combination. Three systems of irradiation with subsidiary chemical treatments are compared and the degree of correlation claimed with natural weathering assessed. The necessity for careful interpretation of results against a wide background of natural exposures, and the dangers of making life prognostications are emphasized. The safe limit of acceleration seems to be of the order of twenty times.

SURFACE TEXTURE: ITS INFLUENCE ON ORGANIC FINISHING

by Dr. Walter Stein and D. H. Lloyd, *England*

In automobile and appliance industries where nearly half the organic finishing material is used on decorative surfaces to improve the surface texture of the metal, rejects for surface irregularities may be attributed either to a bad metal surface, or to the failure of the organic finisher to level it. Lack of "balance" between sections of the plant is the principal factor in heavy surface reject rates. Surface irregularities are divided into three amplitude groups and the probable trend of future development is discussed. The importance of close cooperation between plant designers, paint technologists and production engineers is emphasized.

2:30 p.m. Educational Session ..... **Artillery Armory**

SESSION D

Chairman—William M. Phillips, *United States*

THE INFLUENCE OF THE PHYSICAL METALLURGY AND MECHANICAL PROCESSING OF THE BASIS METAL ON ELECTROPLATING—FERROUS METAL CONDITIONS AFFECTING THE DURABILITY OF WATTS NICKEL DEPOSITS

by Dr. Maurice H. Jones, Chih-Yeu Lu, Dr. A. F. Mohrnheim and J. Zajdowski, *Canada*

As part of the work of AES Research Project No. 14, a study has been made of a number of the factors associated with ferrous bases that may influence the performance of Watts nickel deposits. These include the metallurgical history, the non-metallic inclusion contents, the surface condition resulting from different types of mechanical polishing and the deformation caused by stretching. The relative importance of various conditions and treatments on durability towards accelerated corrosion tests has been evaluated in statistically designed experiments.

THE NATURE OF MECHANICALLY POLISHED SURFACES

by L. E. Samuels, *Australia*

It is usually assumed that mechanical polishing of metal occurs by a mechanism of surface flow. Evidence is reviewed which indicates that flow either by a mechanism of the type proposed by Beilby or by one of gross plastic deformation does not occur in normal practice. Polishing appears to occur primarily by a cutting mechanism. A deformed layer is produced on the surface due to the cutting. Its nature and its possible influence on covering electrodeposits are discussed.

PRICES OF ELECTROPLATING SUPPLIES

Anodes

CADMIUM, per lb	$1.45
COPPER	
Cast elliptical, 18 inches or longer, 5000 lb lots	44.50
Electrodeposited	37.50
BRASS, 80-20, ball anodes, 2000 lb or more	47.50
ZINC, ball anodes, 2000 lb lots (for elliptical add 1¢ per lb)	18.00
NICKEL, 99 pct plus, rolled carbon per lb (rolled depolarized add 3¢ per lb)	$1.0225
TIN, ball anodes, per lb approximately	$1.05

(Cents per lb. unless otherwise stated, freight allowed in quantity)

Primary Metals

GOLD, U. S. Treas., per oz	$35.00
INDIUM, 99.9 per cent, per troy oz	$2.25
LEAD, New York, cents per lb	11.60
PALLADIUM, per troy oz	$18 to 20
PLATINUM, per troy oz	$77 to $80
RHODIUM, per troy oz	$120 to $125
SILVER, New York, cents per troy oz	91.375

Chemicals

BORIC ACID, 100 lb bag N. Y.	10.50
CADMIUM OXIDE, 100 lb drum per lb	$1.45
CAUSTIC SODA, 100 lb, N. Y.	8.50
CHROMIC ACID, flake type, 100 lb drums	30.44
COPPER CYANIDE, 100 lb drum	65.90
COPPER SULFATE, 100 lb bags, per cwt	22.75
NICKEL CHLORIDE, freight allowed, 100 lb	45.00
NICKEL SULFATE, 100 lb	36.00
POTASSIUM CYANIDE, 100 lb drum N. Y.	45.50
POTASSIUM STANNATE, 100 to 300 lb drums	85.70
ROCHELLE SALTS, 100 lb	53.00
SODA ASH, 100 lb	9.10
SODIUM CYANIDE, domestic, f o b N. Y., 200 lb drums	23.70
SODIUM STANNATE, 100 to 600 lbs	70.70
ZINC CYANIDE, 100 lb	60.75
ZINC OXIDE, American process, lead free, 100 to 500 lbs	15.5

(Cents per lb, f o b at point shipped)

Prices in effect April 16, 1959

These prices, while derived from authentic sources, may be expected to vary by geographic location, quantity purchase, FOB and other terms, market influences and variations. They are presented solely as a general guide.

Postage Will be Paid by Addressee

First Class Permit No. 4039, Sec. 34.9, P. L. & R. Newark, N. J.

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

PLATING
445 BROAD STREET
NEWARK 2, NEW JERSEY

Attn.: Reader Service Department

Book Order Card

Please send me the following

☐ AES Member
☐ Non-Member

This card is for ordering Books, ASTM-AES Specifications and Standards (No Charge) and PLATING Binders, $3.25 Canada and Foreign, $4.25

Enclosed is check for $ ..... (Payable to American Electroplaters' Society)
money order

Name .....
Company Name ..... Title .....
Address .....
City ..... Zone ..... State .....
If Non-Member ☐ Please send me literature about the American Electroplaters' Society

KNOWLEDGE OF INESTIMABLE VALUE IN THESE AES RESEARCH PROJECT REPORTS CURRENTLY AVAILABLE

Cleaning and Preparation of Metals for Electroplating, IV, V, VI & VII—By H. B. Linford & E. B. Saubestre — *Serial 26, Project 12, $3.50*

Methods for Testing Thickness of Electrodeposits, II & III—By H. J. Read & F. R. Lorenz — *Serial 27, Project 7, $1.35*

Porosity of Electrodeposited Metals—By N. Thon, D. G. Kelemen, L. Yang, S. Yang, D. Dean — *Serial 28, Project 6, 85 Cents*

The Analysis of Electroplating Solutions for Major Constituents—By E. J. Serfass & M. H. Perry — *Serial 29, Project 2, 90 Cents*

Effect of Basis Metal Condition on Plating, I & II By A. E. R Westman & A. F. Mohenheim — *Serial 30, Project 14, $1.10*

Effect of Surface Finishing on Nonferrous Base Metals on Protective Value of Plated Coatings—By G. J. Kahan, W. W. Macchia, J. M. Fairbank — *Serial 31, Project 4, 45 Cents*

How the Small Electroplater Can Treat Cyanide Plating Waste Solutions with Hypochlorites—By Bernett F. Dodge and Walter Zabban, Yale University, New Haven, Connecticut — *Serial 33, Project 10, 50 Cents*

Effects of Impurities and Purification of Electroplating Solutions, IX, X & XI—By Dr. D. T. Ewing, Dr. A. J. Smith & Dr. W. O. Dow — *Serial 34, Project 5, 50 Cents*

Cleanability and Oil Spreading Rates—By H. B. Linford & P. E. Grubb — *Serial 35, Project 12, 50 Cents*

The Nature, Cause and Effect of the Porosity in Electrodeposits, I & II—By Fielding Ogburn, Asaf Benderly and Margaret Hilkert — *Serial 36, Project 13, $1.00*

Microthrowing Power, A Literature Search—By Esther B. Leffler and Henry Leidheiser Jr. — *Serial 37, Project 17, 75 Cents*

The Influence of the Physical Metallurgy and Mechanical Processing of the Basis Metal on Electroplating IV—By M. H. Jones, Chih-Yeu Lu and J. Zajdowski — *Serial 38, Project 14, $1.25*

Mechanical Finishing of Metal Surfaces—Bibliography—By C. E. Kennedy, J. E. Fritts, R. S. Modjeska, L E. Weeg & R. V. Twyning — *Serial 39, Project 18, 50 Cents*

Include Payment with Order to: **AMERICAN ELECTROPLATERS' SOCIETY, Inc.**
445 Broad Street — Newark 2, New Jersey

▼ *USE SELF-ADDRESSED Return Card to Order Books. Remittance must accompany order.*

First Class Permit No. 4032, Sec. 34.9, P. L. & R. Newark, N. J.

BUSINESS REPLY CARD
No Postage Stamp Necessary if Mailed in the United States

Postage Will be Paid by Addressee

AMERICAN ELECTROPLATERS' SOCIETY
445 BROAD STREET
NEWARK 2, NEW JERSEY

Att. Book Dept.

May 1959. Do not use after July 15, 1959

READER SERVICE CARD

Please send me information on the following—

Ads: A..... A..... A..... A.....
A..... A..... A..... A.....
Tr. Lit.: L..... L..... L..... L.....
E & S: E..... E..... E..... E.....

Name..... Position or Title.....
Company.....
Company Address.....
City..... Zone..... State.....

OUTDOOR CORROSION RESULTS WITH CHROMIUM-NICKEL-CHROMIUM PLATE
by Dr. Henry Brown and Max Weinberg, *United States*

The excellent protection obtained in two and three years of outdoor exposure in an industrial atmosphere for the plating sequences of Cr-Ni-Cr plate, Cu-Cr-Ni-Cr plate and Ni-Cr-Ni-Cr plate on steel and zinc die-cast are detailed, together with the plating procedures used. These results are compared with Cu-Ni-Cr and Ni-Cr plate of various thicknesses. The types of corrosion pits encountered with all these composite coatings are illustrated and compared. The systems with the final sequence of Cr-Ni-Cr, in which the high temperature type of chromium plate, about 0.05 mil, was used underneath the nickel plate, demonstrated outstanding protection against corrosion.

IMPROVED CORROSION RESISTANCE FOR ELECTROPLATED DIE CASTINGS
by Dr. Charles L. Faust, Hugh R. Miller and William H. Safranek, *United States*

A research program sponsored by the American Zinc Institute included a study of many procedures for improving the corrosion resistance of electroplated die castings. Several plating systems showed good corrosion performance in outdoor weathering and accelerated corrosion studies on more than 500 panels and parts. The procedures deemed most practical for commercial production and which are capable of furnishing excellent corrosion protection include: (1) copper, duplex nickel and chromium, and (2) copper, bright nickel, and bright, crackfree chromium. Both systems are practiced commercially. The information in this paper justifies an expansion in production facilities for plating duplex nickel and bright, crackfree chromium, with the objective of improving the performance of die cast automobile hardware.

WEDNESDAY, JUNE, 17

9:00 a.m. Educational Session ..... **Grand Ballroom**

SESSION E

Chairman—Clarence H. Sample, *United States*

CORROSION TESTING OF ELECTRODEPOSITED COATINGS
by F. L. LaQue, *United States*

Corrosion testing is vital to the success of plating. Tests are needed for three principal purposes: (1) To observe the performance of coatings under natural conditions of exposure properly related to actual use. (2) To observe the performance of coatings under conditions that will permit proper appraisal of quality in a time short enough to be useful for inspection and to be helpful in expediting research leading to improved quality. (3) As a tool of research having advantages beyond reduction of the time required to secure useful results. This paper discusses the basic requirements and possible limitations of tests being used or proposed for the purposes mentioned. Appropriate data are included to support the points discussed.

EXPERIENCE WITH THE USE OF THE CORRODKOTE TEST
by Donald M. Bigge, *United States*

The Corrodkote Test has proved to be valuable both as a product acceptance test as well as a dependable means of evaluating research on electroplated copper, nickel and chromium coatings. Rather excellent correlation has been established between service exposure and Corrodkote Test results. Pertinent information is illustrated by means of photographs and charts.

SULFUR DIOXIDE ACCELERATED CORROSION TEST—TESTING CONDITIONS AND EQUIPMENT
by Dr. J. Edwards, *England*

The effect of varying the temperature of the test atmosphere has been investigated; the results indicate that the cabinet in which sulfur dioxide accelerated corrosion tests are made should be thermostatically controlled. Full details are given of the design of a suitable cabinet which will enable temperature, relative humidity and sulfur dioxide concentration to be kept within the recommended limits. A brief discussion is included of the scope and application of this form of accelerated corrosion test.

THE COPPER CHLORIDE MODIFICATION OF THE ACETIC ACID SALT SPRAY TEST
by Cleveland F. Nixon, *United States*

Following a brief discussion of the development of the CASS Test and of the presently recommended operating procedure, data and illustrations are presented to support the view that correlation between test results and out-of-door performance is good enough to make the test useful for both acceptance testing and for evaluating development effort to improve the durability of decorative plating and other finishes. Progress towards better understanding of what happens in the test chamber is reported, the object of this continued work being to further improve correlation of test results between laboratories and to achieve practical reliability in predicting out-of-door performance over several years of service.

9:00 a.m. Educational Session ..... **Michigan Room**

SESSION F

Chairman—Ralph D. Wysong, *United States*

WATER-SOLUBLE COATINGS FOR METAL FINISHING
by Robert A. Boller, *United States*

Water-soluble resins can provide paint formulations and performance characteristics similar to conventional solvent-thinned alkyds, but eliminate the usual fire hazards associated with solvent systems. These water-thinned vehicles exist as clear solutions and remain in one phase when diluted with water. Resins of this type offer the following features: simplicity of paint formulation, ease of pigment dispersion, film continuity, high pigment binding and gloss, mechanical stability and film conversion. Spray application appears to be the most desirable

method of coating. Performance characteristics illustrated by photos, tables and graphs provide evidence that water-soluble resins can produce both primers and enamels for metal which compare favorably to quality solvent-thinned coatings in use today.

EPON RESINS IN THE ELECTROPLATING INDUSTRIES
by H. W. Howard, *United States*

Their superior adhesion, flexibility, toughness and resistance to chemical attack and elevated temperature make the Epon resin coatings of special interest in the electroplating industry. Uses suggested are: clear films over decorative finishes such as silver, brass, bronze, etc.; stop-off coatings; protection of equipment and facilities in the plating room; lining plating tanks and coating racks. Resistance to chemical attack is so hign that a stop-off coating applied before plating may, in some instances, be left on as part of the final finish.

VINYL DISPERSIONS: THEIR USE IN METAL FINISHING
by Myron Perez, *United States*

The use of vinyl dispersions as coatings for metals is discussed, together with basic application techniques and equipment. Principal chemical and physical properties and methods of obtaining them by careful formulation are described. Recently vinyl dispersions, usually spray-applied as smooth, textured or "spattered" coatings have progressed into the decorative area. Some of the newer dispersions, at present either in limited use, or still in the development stage are presented together with suggested fields of usage.

THURSDAY, JUNE 18

9:00 a.m. Educational Session ..... Grand Ballroom

SESSION G

Chairman—Dr. S. Wernick, *England*

THE EFFECT OF FLOW RATE AND CURRENT DENSITY ON THE ELECTROLYTIC REMOVAL RATE OF IRON AND COPPER FROM A WATTS NICKEL SOLUTION
by Dr. Abraham M. Max and M. L. Whitehurst, *United States*

In a diffusion controlled process, the amount of a component remaining with increase in time can be shown to follow a logarithmic decay curve. If the complicating factor of cathode surface roughening is avoided, the electrolytic removal of copper from a Watts nickel solution is shown to follow such a relationship. The removal rate coefficient has been found to increase materially with flow rate from six to fifty feet per minute. Iron removal is complicated by (a) a possible threshold below which iron does not deposit from a nickel solution and (b) precipitation of ferric hydroxide on surfaces if the *p*H is not sufficiently low to keep the ferric ion in solution. The latter is related to the solubility product of ferric hydroxide. Beyond the threshold, the effect of increasing flow rate appears to increase electrolytic removal rate of iron.

CHROMIUM IN CYANIDE SOLUTIONS AND ITS REMOVAL
by Dr. Erich Laue, *United States*

The effects of chromate impurities in cyanide copper plating solutions, and several unsuccessful or undesirable removal processes are discussed. A new method for reducing hexavalent chromium and precipitating the resultant trivalent chromium with alizarin is described. The method may be applied to other alkaline plating solutions, and a number of precipitating agents of the hydroxy anthraquinone type may be used. A simple practical procedure to detect chromium in cyanide copper solutions and to test the effectiveness of the method is illustrated.

THE EFFECT OF SHOT-PEENING AND OF GRINDING ON THE FATIGUE STRENGTH OF CHROMIUM PLATED HIGH STRENGTH STEEL
by R. A. F. Hammond and C. Williams, *England*

The effect of shot-peening prior to chromium plating on the fatigue strength of two steels of 180,000 psi and 224,000 psi tensile strength respectively (and of surface rolling with the weaker steel) has been determined by rotating-bend tests. Various intensities of peening and of rolling have been studied, and the fatigue strengths of the plated steels were shown to increase progressively with the intensity of the surface treatment, ultimately attaining the unplated values. The increase in surface roughness resulting from peening at various intensities was measured for both steels and the effect on the fatigue limit of grinding, before or after chromium plating, to restore a good machine finish was then determined. The effect of baking at various stages was also investigated.

SOME ASPECTS OF THE CORROSION OF DECORATIVE PLATED COATINGS
by Dr. Frederick A. Lowenheim and William H. Rowan, *United States*

The vital importance of improved corrosion performance of decorative-protective plated coatings is emphasized and some current efforts toward this end are reviewed. The value of statistical design in testing is illustrated. Effects of increasing thickness of copper, nickel, and chromium coatings are described. Possible improvement from the use of other coatings, such as 10 per cent tin-bronze as a substitute for copper under nickel, as well as tin-nickel alloy deposit, alone and in combination with other coatings is discussed.

2:30 p.m. Educational Session ..... Grand Ballroom

SESSION H

Chairman—Ezra A. Blount, *United States*

EUROPEAN BRIGHT ANODIZING PRACTICE
by A. W. Brace, *England*

The response to bright anodizing is dependent on the composition and metallurgical structure of the aluminum, and these factors are briefly discussed. Both chemical and electrochemical brightening techniques are discussed. The influence of anodizing and sealing conditions on resistance to atmospheric corrosion is described, and methods for testing anodic coatings are summarized.

HYDRATION OF ANODIC OXIDE FILMS
by M. S. Hunter, P. F. Towner and D. L. Robinson, *United States*

The mechanism of hydration of anodically formed aluminum oxide films during sealing in boiling water is discussed and the progress of hydration is demonstrated by electrical measurements and illustrated by electron micrographs. Sealing of commercial anodic coatings is considered in the light of evidence indicating that the usual practices employed do not result in complete filling of the pores in the coating. The effects of various factors in accelerating and retarding the rate of hydration are also discussed.

ANODIZING PROCESSES FOR THE PRODUCTION OF VERY THICK ALUMINA FILMS
by P. Lelong, R. Segond and J. Hérenguel, *France*

Numerous anodic oxidation processes have been developed for forming thick and hard alumina films on aluminum alloys. Most of these processes make use of electrolytes at very low temperature. Processes developed in France make possible the formulation of thick hard films at or above temperatures normally used. The electrolytes are made from acid salts and organic acids. Two of these solutions are described in detail; one a solution of sodium bisulfate and citric acid, and the other, a solution of oxalic and formic acids. These processes permit the formation of films several hundred microns thick (24 microns-1 mil) at unusually high current densities.

DEVELOPMENTS IN THE SURFACE TREATMENT OF ALUMINUM—PROCESSES AND MATERIALS
by Dr. Richard Lattey, *Germany*

Industry requirements for bright anodized aluminum have stimulated production of superpurity aluminum. This paper explains the necessity for anodic or chemical brightening prior to bright anodizing. The theory of anodic chemical brightening is discussed, and the role of passivating surface coatings and films therein is indicated; adnodizing is discussed in a similar manner. Specific processes for brightening and anodizing are ducsucced in some detail, as well as control methods. Mention is made of a new commercial aluminum alloy which is competing favorably with super-purity aluminum on many applications.

FRIDAY, JUNE 19

9:00 a.m. Educational Session ..... **Michigan Room**

SESSION I

Chairman—A. W. Wallbank, *England*

ELECTROCHEMICAL TECHNIQUES IN MODERN METALLOGRAPHY
by Dr. Pierre A. Jacquet, *France*

The value of metallography in modern metallurgy is widely recognized. The importance of electrochemistry in the transition of metallography from an art to a science, and in the x-ray and electronic examination of metal surfaces is discussed. A new advance, combining non-destructive "plug electropolishing" and an improved replica procedure is described. Electrolytic methods are reviewed, and techniques described for preparing surfaces for microscopic examination or for making replicas for optical and electronic micrographs. A number of photomicrographs, including a few showing copper, nickel and chromium coatings, illustrate results obtained with the techniques described.

THE PRESENT STATE OF ELECTROLYTIC POLISHING IN EUROPE
by Robert Mondon, *France*

Electrolytic polishing, born in the laboratory about 30 years ago for the examination of metallographic specimens, has progressed steadily in this field, and has been helpful in studying the influence of surface distortion caused by machining and usual finishing methods on fundamental properties, such as friction and wear and resistance to fatigue and certain types of corrosion. The use of electrolytic polishing in the decorative field in Europe has been retarded by unavailability of suitable basis metals. Its widest industrial uses are non-decorative, such as deburring, improving corrosion resistance and smoothening metal surfaces.

ELECTROLESS COPPER PLATING
by Dr. Edward B. Saubestre, *United States*

The process of electroless copper plating is discussed with particular reference to coating of plastics in the manufacture of printed circuits. The development work described may be subdivided into the following steps: (1) selection of a sensitizer, (2) selection of a reducing agent, and (3) selection of a copper solution. Discussion is also made of formula suitable for depositing thin copper mirrors and for depositing 1-2 mil copper coatings.

SOME CHEMICAL POLISHING PROCESSES—THEIR MECHANISM AND THEIR APPLICATION
by Dr. H. Spahn, *Germany*

In the chemical polishing of copper and its zinc- and zinc-nickel-alloys, the dissolution rate is controlled by the kinetics of the formation of nitrous acid in the viscous layer surrounding the metal. The role of nitrous acid is discussed using data of electrochemical measurements, viscosity and water activity in the viscous layer. The mechanism of polishing zinc, aluminum and nickel is illustrated. Properties of chemically polished surfaces are discussed and compared with surfaces produced by electrolytic polishing. A short survey of control methods for chemical polishing solutions is given, and some commercial processes tabulated.

INFLUENCE OF VARIOUS SURFACE TREATMENTS ON THE RESISTANCE TO FATIGUE OF TWO HIGH STRENGTH ALUMINUM ALLOYS
by Gaetan Abadie and Georges Vidal, *France*

The two alloys studied are normally used in the production of large aircraft landing gear forgings. The surface treatments studied were chemical milling, electro-polishing, anodizing,

acid etching and a proprietary chromate treatment. The fatigue tests were made by means of Schenk fatigue machines of the "Webi" type with 10^4 and 10^6 alternations at rupture.

9:00 a.m. Educational Session ..... **Grand Ballroom**

SESSION J

Chairman—A. A. B. Harvey, *England*

THE EFFECT OF METAL PREPARATION ON THE PERFORMANCE OF WATER THINNED COATINGS

by R. A. Williams, *United States*

For this investigation, four different proprietary water thinned vehicles, two of the water soluble vehicle type and two of the emulsion type, were used. A petroleum solvent thinned primer was included as a control. Humidity salt spray and water immersion resistance as well as film hardness, gloss and flexibility were investigated. Seven different types of metal treatment were performed on steel panels prior to coating and their effects tabulated. All tests were carried out in quadruplicate.

VINYLS IN MODERN INDUSTRIAL COATINGS

by W. H. McKnight, *United States*

The principal types of vinyl materials discussed are vinyl solution coatings, organosols, and plastisols, all of which are normally baked. Typical molecular structures, methods of manufacture, physical and chemical properties are discussed. Because adhesion is an important formulating problem, primers have received considerable attention. Formulating principles are discussed in detail. New applications for organosols and plastisols are appearing frequently, and a brief forecast of expected striking developments is presented.

PROTECTING SILVER AND COPPER AGAINST TARNISHING BY MEANS OF A CHROMATE PASSIVATING PROCESS

by Dr. P. Baeyens and J. L. Melse, *Holland*

The paper describes the experimental work on which are based improvements in the method of obtaining protection of silver or copper by immersion in solutions of hexavalent chromium compounds. To obtain good passivation consistently, without interfering appreciably with the solderability of either silver or copper, certain metal-complexing agents are added to the hexavalent chromium solution so as to maintain a defined relationship between the *p*H value of the solution and the metal solution potential.

CHROMIC ACID ANODIZING CHARACTERISTICS OF WROUGHT ALUMINUM ALLOYS

by George E. Best, J. G. Hecker Jr., John W. McGrew and R. V. VandenBerg, *United States*

Experimental preparation of chromic acid anodized coatings has been carried out with the following wrought aluminum alloys: 1100, 2024, 3003, 5052, 5056, 6061, 7075, Alclad 2014 and Alclad 7075. Operating variables of voltage, time, bath *p*H and temperature were explored above and below the chosen standard of 40 v–30 min.—*p*H 0.5—95F. Measurements were made of current density, coating weight, coating thickness, dielectric strength, and salt spray resistance, with calculations of coating weight per ampere-minute, electrical and coating efficiencies.

2:30 p.m. Educational Session ..... **Artillery Armory**

SESSION K

Chairman—Dr. Abner Brenner, *United States*

BARREL PLATING WITH SPECIAL CONSIDERATION TO PROTECTION OF THREAD DIAMETERS

by A. W. Wallbank, *England*

The importance of batch size in selection of barrel plating equipment and rival methods of constant weight and constant area in barrel loading are discussed, as well as equipment and solutions for barrel chromium plating. The effect of deposit variation in the load is discussed and reasons given for the adoption of Batch Average as the criterion of quality. A method for calculation of probability of interference with various deposits and thread diameters is derived and explained. Methods are suggested for protecting thread diameters when the standard allowance is insufficient for the required deposit.

DUCTILITY IN PLATED COATINGS

by Dr. Harold J. Read and Dr. Thomas J. Whalen, *United States*

Ductility of plated coatings is of importance as a factor in corrosion, and in forming pre-plated strip. Because plated coatings are thin, useful data can be obtained only in a test which is convenient and useful for specimens which would usually be described as brittle foils. The Jovignot hydraulic bulge test has been adapted to this problem, and data agree well with that obtained with the traditional tensile test, which is difficult to use on brittle foils. New convenient self-contained rapid equipment is described which can be operated by skilled personnel. "Significant strain" is explained and the method of obtaining strain data from the hydraulic bulge test is described. Effects of bath composition and plating conditions on the ductility of some plated coatings are shown.

GRAIN SIZE CONTROL IN ELECTROFORMING

by H. Denis Hughes, *England*

ELECTRODEPOSITS AS RESISTS IN SELECTIVE HEAT TREATING

by R. Scott Modjeska and Simon P. Gary, *United States*

Mild steel (SAE-1010) rods partially masked plated with copper, tin-bronze, tin, silver and nickel are carburized or nitrided. Efficiencies as resists are compared. Micro studies of the electrodeposits before and after heat treating are compared in an attempt to learn mechanism of resist. Included are formulae and operating conditions for plating baths employed and data on heat treating conditions.

EXHIBITORS AT THE AES
FIFTH INDUSTRIAL FINISHING EXPOSITION

DETROIT ARTILLERY ARMORY, OAK PARK, MICHIGAN
JULY 16-19, 1959

Exhibitor	Booth No.
Abbey Process Automation, Inc. 37-01 48th Avenue, Long Island City 1, N. Y. Automatic barrel plating and rack anodizing systems.	319-326
Abrado Finish Corp. 1750 Elizabeth, N. W., Grand Rapids 4, Mich. Barrel Finishing Equipment.	34
Acme Manufacturing Co. 1400 E. Nine Mile Road, Ferndale, Mich. Semi-automatic machines and small flat stock polishing machines.	270 & 272
Alchemize Corp. Congress Expressway at 621 South Kolmar Ave., Chicago 24, Ill. Chemical polishing supplies.	276
Allied Industrial Products, Inc. 620 No. Michigan Ave., Chicago 11, Ill. Bias buff	62
Allied Research Products, Inc. 4004 Monument St., Baltimore, Maryland. Rectifiers, automatic loaders and processes.	176-179
American Air Filter Co., Inc. Central Ave. at 2nd St., Louisville, Kentucky. Dust collectors, acid mist, fume collectors.	129 & 130
American Buff Co. 2414 S. LaSalle St., Chicago 16, Ill. Buffing and polishing wheels, flexible abrasive wheels.	1-6
American Metal Climax, Inc. 21 E. 26th St., New York 10, N. Y. Copper anodes and related items.	230
American Optical Co., Instrument Division. Eggert & Sugar Roads, Buffalo 15, N. Y. Recording Electro-Polarizer.	296
American Smelting & Refining Co. 120 Broadway, New York 5, N. Y. & Divisions: **Enthone, Inc.** **Federated Metals** **Abbey Process Automation, Inc.** Anodes, brighteners, strippers, blackening compounds, preservatives, plating chemicals and equipment.	316-318 106-110 111 319-326
Automotive Rubber Co., Inc. 12550 Beech, Detroit, Mich. Air pollution control equipment, air scrubbers and washers, acid handling equipment, repair kits, plating racks, valves.	281-284
Baird Machine Co. 1700 Stratford Ave., Stratford, Conn. Barrel finishing machinery.	211
Battelle Development Corp. 505 King Ave., Columbus 1, Ohio.	91
Beacon Supply Co. 110 Marginal Ave., Chelsea, Mass. Buffing wheels.	49
Belke Manufacturing Co. 947 N. Cicero Ave., Chicago, Ill. Plating barrels, filters, tank magnet, rheostat, fibreglass materials, racks.	143 & 146
Bias Buff & Wheel Div., Riegel Textile Corp. Conover, N. C. Buffs and related materials.	112
Bison Corp. 1935 Allen Ave., S. E., Canton, Ohio Buffing wheels and plating brighteners.	245 & 246
G. S. Blakeslee & Co. 1822 S. Laramie, Chicago 50, Ill. Degreasing and metal parts washing machines.	180-182
Branson Ultrasonic Corp. Stamford, Connecticut. Ultrasonic cleaning equipment.	31 & 32
Bruce Products Co. 500 N. West St., Howell, Michigan. Buffing & polishing compounds, drawing & forming compounds, grinding coolants, rust preventives.	155 & 156
Buckingham Products Co. 14100 Fullerton, Detroit 27, Michigan. Polishing and buffing compositions.	41 & 42
The Carborundum Co. Niagara Falls, N. Y. Barrel finishing machines, equipment, media and compounds.	161 & 162
Carpart Corp. 209 W. Exchange St., Owosso, Mich. Corrosion resistant hoods, tank liners, exhaust systems and fume collectors.	11
Casalbi Co., Globe Div. 540 Wayne St., Jackson, Mich. Barrel finishing equipment, supplies & accessories.	17
The Chemical Corp. 54 Waltham Ave., Springfield, Mass. Chromate conversion coatings.	50
Circo Equipment Co. 51 Terminal Ave., Clark, New Jersey. Ultrasonics, degreasers, steam cleaners.	120 & 121
Clementina, Ltd. 2277 Jerrold, San Francisco 24, Cal.	117
Cleveland Process Co. 1967 E. 57th, Cleveland 3, Ohio. Electric immersion heaters, quartz ovens and sections.	206-209
Clifford-Rockwell Co. 19364 James Couzens Highway, Detroit 35, Mich. Metal finishing materials, belts, buffs, brushes, buffing compounds.	212 & 213
Corning Glass Works Corning, N. Y. Heat exchangers, industrial radiant heat.	74
Conversion Chemical Corp. 98 E. Main St., Rockville, Conn. Chromate conversion coatings and bright dips.	128
Cowles Chemical Corp. 7016 Euclid, Cleveland 3, Ohio. Visual displays, cleaning processes.	37
Davies Supply & Mfg. Co. 4160 Meramec St., St. Louis 16, Mo. Plating racks and plastisol coatings.	249
Dean Products, Inc., Thermo-Panel Div. 616 Franklin Ave., Brooklyn 38, N. Y. Thermopanel coil	151-154
Deering, Milliken & Co., Inc. 1045 Sixth Ave., New York, N. Y. Buffing fabrics.	12 & 13

Exhibitor	Booth No.
Detrex Chemical Industries 14331 Woodrow Wilson, Detroit 32, Mich. Cleaning and coating compounds, solvents, degreaser and ultrasonic equipment.	63 & 64
The Diversey Corp. 1820 W. Roscoe St., Chicago 13, Ill. Anodizing pre-treatment and a new stainless steel bright dip process.	328 & 329
Dow Chemical Co. Midland, Michigan.	223 & 224
E. I. duPont de Nemours & Co. 1007 Market St., Wilmington 98, Delaware.	144 & 145
Du-Lite Chemical Corp. Middletown, Connecticut.	40
Du-Tone Chemical Co. 1208 Greenfield, Waukegan, Illinois. Electroplating processes and supplies.	124
Eaton Chemical & Dyestuff Co. 1490 Franklin St., Detroit 7, Mich. Chemicals, anodes, anodizing dyes, plating chemicals.	45
Electro-Glo Corp. 625 S. Kolmar Ave., Chicago, Ill. Electropolishing supplies.	273
Erie Engine & Manufacturing Co. 953 East 12th St., Erie, Pa.	171 & 172
Electronic Rectifiers, Inc. 2102 Spann Ave., Indianapolis 3, Indiana Dry contact rectifiers, rectifier power supplies, accessories.	99
Enthone, Inc. 442 Elm Street, New Haven, Conn. Metal strippers, blackening and alkaline derusting compounds, paint strippers, plating processes, buffing compound removers, tarnish and corrosion preventives.	106-110
Fiftieth Anniversary Lounge. **American Electroplaters' Society** **Plating Magazine** **AES Research Program**	Lounge
Finish Engineering Co., Inc. 1115 Cherry St., Erie, Pa. Tools and machines for decoration of castings and stampings.	228 & 229
Formax Manufacturing Corp. 3171 Bellevue, Detroit 7, Mich. Buffs and Buffing compounds.	231-234
G. S. Equipment Co. & G. S. Plastics Co. 15583 Brookpark Rd., Cleveland 35, Ohio. Plating barrels, corrosion test cabinets, corrosion resistant protective coatings & linings.	294 & 295
General American Transportation Co. 135 S. LaSalle St., Chicago 90, Ill. Chemical nickel alloy plating on various items.	252
Glo-Quartz Electric Heater Co. 4066 Erie St., Willoughby, Ohio. Electric immersion heaters, thermostats, infrared oven panels.	167 & 168
Grav-I-Flo Corp. 400 Norwood Ave., Sturgis, Mich. Mechanical finishing equipment.	147-150
Great Lakes Carbon Corp. 333 No. Michigan Ave., Chicago 1, Ill. Filter Aid	113
Hammond Machinery Builders, Inc. 1600 Douglas, Kalamazoo, Mich. Automatic polishing, buffing and deburring equipment.	261-266
Hanson-Van Winkle-Munning Co. 100 Church St., Matawan, N. J. Electroplating and polishing equipment and supplies.	299-314
Hardwood Line Manufacturing Co. 2022 N. California, Chicago 47, Ill. Lucite plating barrels.	83
Harshaw Chemical Co. 1945 E. 97th St., Cleveland 6, Ohio Developments in electroplating	267-269
Haviland Products Co. 421 Ann St., N. W., Grand Rapids, Mich.	289
Heatbath Corp. Box 78, Springfield, Mass. Black oxide finishes, chromate coatings, aluminum brite dips, rust proofing compounds.	291-293
Heil Process Equipment Corp. 12901 Elmwood, Cleveland 11, Ohio. Corrosion resistant process equipment—lined tanks, acid proof heating equipment and corrosion-resistant ventilating equipment.	285 & 288
Hitchcock Publications—Grinding & Finishing Magazine. Wheaton, Ill. Publications.	92 & 93
R. O. Hull & Co., Inc. 1300 Parsons Ct., Rocky River 16, Ohio.	81 & 82
Industrial Filter & Pump Manufacturing Co. 5900 Ogden, Cicero, Ill. Pressure filters, ion exchangers, demineralizers, water softeners, centrifugal pumps, heat exchangers, waste treatment systems.	139-142
Industrial Instruments, Inc. 89 Commerce Road, Cedar Grove, N. J.	216
Industrial Plastic Fabricators, Inc. Endicott St., Norwood, Mass. PVC and fiberglass centrifugal fans, model PVC exhaust system, air washer.	135 & 136
International Nickel Co. 67 Wall St., New York 5, N. Y. Nickel plated material.	189 & 190
Ionic Electrostatic Corp. 111 Monroe St., Garfield, N. J. Electrostatic spray system.	277-280
Kocour Co. 4800 S. St. Louis, Chicago 32, Ill. Analytical set and instruments, buffing and finishing materials.	67 & 68
Kolene Corp. 12890 Westwood Ave., Detroit 23, Mich. Paint stripping, de-enameling.	114 & 115
Kraft Chemical Co. 917 W. 18th, Chicago 8, Ill. Chemical cyanides, raw materials.	9
La Salco, Inc. 2820 LaSalle, St. Louis 4, Missouri.	327 & 330
The Lea Manufacturing Co. 16 Cherry Ave., Waterbury 20, Conn. Industrial abrasive compositions and electroplating processes.	204
Lea-Ronal, Inc. 139-20 109th Ave., Jamaica 35, N. Y.	205
A. H. Losey Co. 110 S. Horton St., Jackson, Mich. Automatic polishing and buffing machines.	78
MacDermid, Inc. Waterbury 20, Conn. Compounds for cleaning copper plating, specialties, chromates.	185-188
Manpro Corp. 1360 Hilton Rd., Detroit 20, Mich. Vapor degreasers and metal driers.	131 & 132
McAleer Manufacturing Co. 101 S. Waterman, Detroit 17, Mich. Polishing and buffing compounds, bias-type cloth buffs, etc.	254 & 255
McGean Chemical Co. 1040 Midland Bldg., Cleveland 15, Ohio. Anodes and chemicals for metal finishing.	169 & 170
Merit Products, Inc. 3691 Lenawee Ave., Los Angeles 16, Cal. Specialized abrasive wheels and machinery.	173
Metal & Thermit Corp. Woodbridge Rd., Rahway, N. J. Plating materials and equipment.	199-203
Metal Finishing Magazine 381 Broadway, Westwood, N. J. Historical Exhibit, dating from 1903	Lounge
Michigan Buff Co., Inc. 3503 Gaylord, Detroit 12, Mich. Buffs, polishing wheels and abrasives.	79 & 80
Michigan Chrome & Chemical Co. 8615 Grinnel, Detroit 13, Mich. Rack coatings, stop-off materials, organic coatings.	16
Minnesota Mining & Manufacturing Co. 900 Bush Ave., St. Paul, Minn. Barreling finishing media and compounds.	38 & 39
Murray-Way Corp. Box 180, Birmingham, Mich. Polishing and buffing equipment.	96-98

Exhibitor	Booth No.
NRC Equipment Corp. 160 Charlemont St., Newton 61, Mass. Vacuum metallizing equipment and samples of metallized parts.	57 & 58
Geo. L. Nankervis Co. 15300 Fullerton Ave., Detroit 27, Mich. Waste disposal unit.	51
National Association of Metal Finishers 60 Bently Rd., Cedar Grove, N. J. Association Activities.	138
National Carbon Co., Div. of Union Carbide Corp. 535 Fifth Ave., New York 17, N. Y. Impervious graphite including heat exchangers, pumps, pipes and fittings.	84
New Holland Machine Co. 723 North Prince St., Lancaster, Pa. Centrifugal dryers.	125
Nordson Corp. Jackson St., Amherst, Ohio. Airless spray painting equipment.	89
Oakite Products, Inc. 19 Rector St., New York 6, N. Y. Materials and methods for metal cleaning, surface preparation and electro-cleaning prior to plating and finishing.	72 & 73
Pennsalt Chemicals Corp. 3 Penn Center Plaza, Philadelphia 2, Pa. Product literature.	7
Perma-Line Rubber Products Corp. 1755 No. Winnebago Ave., Chicago 47, Ill. Tank linings, tool kit for repairing PVC tank linings.	15
Phillips Manufacturing Co., Inc. 3475 W. Touhy Ave., Chicago, Ill. Degreasers.	47 & 48
Platers Research Corp. 61 East 4th St., New York 3, N. Y. Metal cleaners, brighteners, additive agents and other plating specialties.	247
Plating Magazine 445 Broad St., Newark, N. J. Odyssey of a PLATING MAGAZINE issue.	50th Anniversary Lounge
Pockrandt, Inc. 1108 Marquette Ave., Bay City, Mich. Non-flammable paint removers and cleaners, also metal preparation.	225
Precision Metal Molding Magazine 812 Huron Road, Cleveland 15, Ohio.	71
Pressure Blast Manufacturing Co., Inc. 27 Pleasant St., Manchester, Conn. Wet blasting equipment.	53
Productive Equipment Corp. 2926 W. Lake St., Chicago 12, Ill. Deburring and burnishing equipment.	85 & 86
Products Finishing Magazine 431 Main St., Cincinnati 2, Ohio. Plating equipment of "yesterday."	Lounge
Rampe Manufacturing Co. 14915 Woodworth Ave., Cleveland 10, Ohio. Precision barrel finishing equipment, tumbling barrels.	69
Ransburg Electro-Coating Corp. 1234 Barth Ave., Indianapolis 7, Ind. Electro-static hand gun.	165 & 166
Rapid Electric Co. 2881 Middletown Rd., Bronx 61, N. Y. Power rectifiers.	76 & 77
Republic Lead Equipment Co. 7930 Jones Road, Cleveland, Ohio Lead anodes	297
Reynolds Metals Co. 6601 W. Broad St., Richmond 18, Va.	133 & 134
Robe, Inc. 507-509 New York St., Scranton 9, Pa. Anodizing racks.	14
S & C Manufacturing Co. 6245 Wiehe Road, Cincinnati 13, Ohio.	160
Schaffner Manufacturing Corp. Schaffner Bldg., Emsworth, Pittsburgh, Pa. Buffs, buffing and polishing wheels, compounds.	183 & 184
Sel-Rex Corp. 75 River Road, Nutley, N. J. Precious metals plating processes, rectifiers, fillers.	235-238
Service-Rack Division of Servi-Sure Mfg. Co. 131 No. Green St., Chicago 7, Ill. Anodizing racks, electropolishing racks.	70
Sethco Manufacturing Corp. 2284 Babylon Turnpike, Merrick, L. I., N. Y. Filter pump units.	65
J. J. Siefen Co. 5657 Lauderdale, Detroit 9, Mich. Liquid spraying equipment.	250 & 251
Siefen Compounds, Inc. 14325 Wisconsin, Detroit 38, Mich. Spray equipment, liquid buffing compounds.	23
Sifco Metachemical, Inc. 935 E. 63rd St., Cleveland 3, Ohio. Selective plating equipment, micrograin nickel electroforms.	122 & 123
Solventol Chemical Products, Inc. 15841 Second Ave., Detroit, Mich. Metal cleaning products.	174 & 175
Sparkler Manufacturing Co. Mundelein, Ill. Filtration equipment.	286 & 287
Standard Electric Tool Co. 2488 River Rd., Cincinnati 4, Ohio.	43 & 44
F. B. Stevens Co. 1800 18th St., Detroit, Mich. Metal finishing equipment, buffing and polishing compositions.	191-194
F. J. Stokes Corp. 5500 Tabor Road, Philadelphia 20, Pa. Vacuum metallizing equipment.	94 & 95
The Stutz Company 4450 W. Carroll Ave., Chicago 24, Ill. Mechanical plating equipment.	257 & 260
Techline Division of Wheelabrator Corp. 2400 Avenue V, Vicksburg, Mich. Barrel finishing and wet blasting equipment.	118 & 119
Technic, Inc. 39 Snow St., Providence, R. I. Examples of precious metal electroplating.	217
Ther Electric & Machine Works 17 S. Jefferson, Chicago 6, Ill. Rectifiers.	258 & 259
Tranter Manufacturing, Inc. 735 E. Hazel St., Lansing 9, Mich. Equipment shown in cut-away tank applications.	214 & 215
H. O. Trerice Co. 1420 W. Lafayette, Detroit, Mich.	253 & 256
Turco Products, Inc. Terminal Annex 2649, Los Angeles 54, Calif. Phosphate coatings, aluminum conversion coatings, magnesium coatings, rust remover.	226 & 227
Udylite Corp. Detroit 11, Mich.	239-244
Unit Process Assembles, Inc. 61 East 4th St., New York 3, N. Y. Non-destructive plating thickness tester and periodic reverse units for plating, alkaline derusting and descaling.	248
U. S. Stoneware Co. 220 W. Market St., Akron, Ohio. Corrosion resistant materials.	298
Universal Tumbling Supply Co. 18613 Lancashire, Detroit 13, Mich. Tumbling supplies, sample parts and castings.	46
Univertical Foundry & Machine Co. 14841 Meyers Rd., Detroit 27, Mich. Anodes, plating supplies.	163 & 164
Vanton Pump & Equipment Corp. 201 Sweetland Ave., Hillside, N. J. Plastic pumps, valves, other plating equipment.	210
A. T. Wagner Co. 2720 Wight St., Detroit 7, Mich. Supplies.	66
Wayne Products Corp. 114 Olive St., Palatine, Illinois. Filtration equipment for solutions air and water.	10
Westinghouse Electric Corp. Gateway #3, P. O. Box 868, Pittsburgh 30, Pa.	195-198
Wyandotte Chemicals Corp. Wyandotte, Mich. Chemical products for metal finishing, cleaners, paint removers, barrel finishing compounds, rust and scale removers.	157-159

INTERSOCIETY NEWS

PUTNAM NAMED ASM MANAGING DIRECTOR

Allan Ray Putnam has been appointed managing director of the American Society for Metals.

A. R. Putnam

As managing director of the Metal Society, Mr. Putnam will occupy a new position established by the ASM Board of Trustees following the death last May of William H. Eisenman, a founder-member of the society and its national secretary and executive head for 40 years.

Mr. Putnam comes to the ASM from Detroit where he is assistant executive secretary of the American Society of Tool Engineers.

The society is broadening its educational program and in mid-summer will move into a new headquarters building, 23 miles east of downtown Cleveland. The new building, which will house more than 100 staff members serving the 106 chapters of the society, is distinguished by the world's largest geodesic dome or "space lattice". The dome is a symbol of man's progress in metals and was deliberately conceived to stir the imagination of those observing the all metal structure.

Mr. Putnam was graduated in 1942 from the Wharton School of Finance and Commerce of the University of Pennsylvania with a degree in economics. Following four years in the Army Air Force as a captain, he joined the American Electroplaters' Society as advertising manager.

In 1949 the American Society of Tool Engineers appointed him assistant executive secretary and publisher of "The Tool Engineer".

Mr. Putnam has been active in the Council of Engineering Society Secretaries and is currently serving as its president. He was president of the National Association of Exhibit Managers in 1955. His memberships also include the American Society of Association Executives, the American Management Association, the National Industrial Advertisers Association, the American Marketing Association, the American Dialect Society, and the Engineering Society of Detroit.

Mr. Putnam is married and has three children, aged 5 to 12.

NACE CONFERENCE AND CORROSION SHOW SET

Corrosion in the missile industry is included among 17 technical symposia to be given at the 16th Annual Conference of the National Association of Corrosion Engineers, March 14–18, 1960, in Dallas, Texas.

Other symposia are cathodic protection, corrosion inhibitors, protective coatings, corrosion principles, general corrosion and corrosion at elevated temperatures.

J. C. Spalding Jr., Sun Oil Company, Dallas, is general chairman of the conference committee. J. G. Meek of Metal Goods Corp., Dallas, is vice-chairman. Technical program chairman is S. K. Coburn, Association of American Railroads, Chicago.

The 1960 Corrosion Show, to be held in Dallas Memorial Auditorium in conjunction with the conference, will feature latest developments in process, materials, methods and equipment for corrosion control. The show will be held in the auxiliary exhibit area of the auditorium. Technical meetings of the conference will be held on the two floors above the exhibit area.

A total of 121 booths, each 8 by 10, will be available. Information may be obtained by writing R. W. Huff Jr., Exhibition Manager, 1061 M & M Building, Houston 2, Texas.

NAMF ANNOUNCES SEMINAR THEME

"Management Tools" is the theme of the 1959 convention and management seminar of the National Association of Metal Finishers. Scheduled to be held at the Hotel Statler-Hilton, Detroit, from June 14 to 16, the forthcoming NAMF conclave is under the general chairmanship of Glenn H. Friedt Jr. of United Platers, Inc., Detroit.

The three-day session begins with the usual business meetings on Sunday, June 14, and proceeds through Tuesday, June 16, featuring three industry management experts. A prominent figure of the automotive industry will be the speaker at the final banquet on Tuesday evening.

Chairman Friedt has announced that management seminar discussions will be "off-the-record" and will not be published. Talks, however, will appear in the association's publication.

The NAMF will also sponsor an exhibition booth at the 5th Industrial Finishing Exposition, presenting many kinds of finishes on metal products, committee projects and other NAMF activities.

ASME CONFERENCE SCHEDULED FOR MAY

Sessions on the choice of materials in design, mechanical aspects of design, and power and control in design will be featured at the fourth annual Design Engineering Conference, sponsored by the machine design division of the American Society of Mechanical Engineers.

The conference is held concurrently with the Design Engineering Show. Both events will take place at Convention Hall, Philadelphia, May 25–28, inclusive, with conference sessions in the morning and the show in the afternoon.

Speaking on May 27 will be E. Burt Friedl, principal chemist, corrosion research division; Louis J. Nowacki, assistant chief, organic coatings research, and William H. Safranek, assistant chief, electrochemical engineering division, Battelle Memorial Institute.

Their topic is "Latest Developments in Materials and Coatings to Resist Atmospheric Corrosion."

Co-chairmen of this session, entitled "Materials," will be R. V. VandenBerg of Aluminum Co. of America and E. H. Phelps, U. S. Steel Corp.

CORROSION COURSE TO BE CONDUCTED AT MIT

A course in fundamentals of corrosion reactions and corrosion control will be given at Massachusetts Institute of Technology June 22–26, 1959. The National Association of Corrosion Engineers will furnish services in conjunction with the short course which will be conducted on an intermediate level.

The course will be designed for those who have had previous corrosion instruction or experience in the corrosion field and wish to enlarge their understanding of fundamentals.

Reaction mechanisms and interpretation of laboratory and field measurements from the standpoint of modern electrochemical and metallurgical concepts will be emphasized.

Subjects to be covered include the meaning and interpretation of electrode potentials and polarization measurements, metallurgical factors affecting corrosion in certain stress corrosion cracking and corrosion fatigue, corrosion inhibitors and mechanisms of oxidation and tarnish.

Additional information can be furnished by James M. Austin, Director of Summer Session, Massachusetts Institute of Technology, Cambridge 39, Mass.

INDICATE B 501. ➤

Lea Methods
AND
Lea Compositions

FOR
EYE
APPEAL
PLUMBING
FIXTURES...

FAMOUS
AMERICAN MADE
ANYSTREAM®
SHOWER HEAD

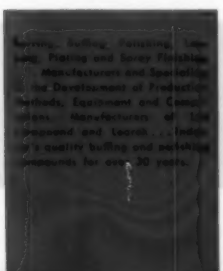
FOR EYE APPEAL FINISHES ON ALL METALS, SPECIFY . . . .

Lea Methods AND Lea Compositions

EXHIBIT
JUNE 15-19
DETROIT ARTILLERY ARMORY
Booths 204A and 205A tell the story of the broad Lea and Lea-Ronal Service to your industry. Come in and talk things over.

Yes, Sir!...LEA helps provide eye appeal for SPEAKMAN. These quality plumbing fixtures are designed to appeal to the modern home owner and the finish on these fixtures must be the FINEST. One of the industry's outstanding manufacturers of brass fittings is SPEAKMAN of Wilmington, Delaware. For pre-plating operations on many of their fixtures SPEAKMAN specifies the use of LEA METHODS and LEA COMPOSITIONS. SPEAKMAN is justly proud of its Modern Design and proud of its Quality Finish.

For hand or automatic finishing on almost any metal, with either liquid or bar composition, there is a Lea Composition and a Lea Method which will give you a better finish and real production economy. Why not call or write us today about your finishing requirements.

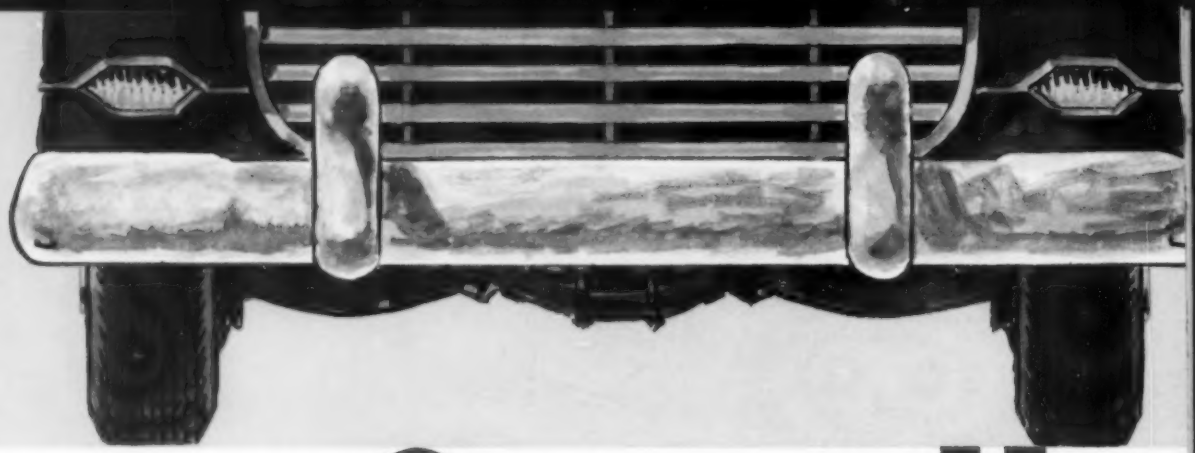


THE LEA MANUFACTURING CO.
16 CHERRY AVE. • WATERBURY 20, CONN.

Lea-Michigan, Inc., 14459 Wildemere, Detroit 38, Mich.
Lea Mfg. Company of Canada, Ltd., 1236 Birchmount Road, Scarborough, Ontario, Canada
Lea Mfg. Company of England, Ltd., Buxton, England
Lea-Ronal, Inc., Main Office and Laboratory: 139-20 109th Ave., Jamaica 35, N. Y.
Manufacturing Plant: 237 East Aurora St., Waterbury 20, Conn.

The Hallmark of Quality Products

Are you interested in plating specialties? SEE THE OTHER SIDE OF THIS INSERT



LEA-RONAL Cuprall and re-claimed bumpers...

HIGH SPEED DEPOSITION OF BUFFABLE COPPER — THE KEY TO EFFECTIVE AND ECONOMICAL RE-PLATING

***LEA-RONAL** is widely known for its superior plating formulations for both industrial and decorative finishes. Our technical staff will be glad to help you with any plating problem you may have.*

CUPRALL can stand a lot of tough operations, imperfect stripping of old plate, dirty solutions...all of which are part and parcel of this business of re-claiming and re-plating automobile bumpers. It's the best foundation you can use for nickel and chromium. Its increased plating speed and better buffability make Cuprall the natural choice for use in refinishing bumpers.

If you are in this bumper refinishing business or even if your requirements are less severe, we suggest that you set up your plating bath for a good test of the effectiveness of CUPRALL. Write to us in detail about your present operation and we'll be glad to recommend the proper quantity for a good test.

Write or phone THE LEA MFG. CO., 16 Cherry Avenue, Waterbury 20, Conn., through whom CUPRALL is exclusively marketed.

EXHIBIT
JUNE 15-19
DETROIT ARTILLERY ARMORY

Booths 204A and 205A tell the story of the broad Lea and Lea-Ronal Service to your industry. Come in and talk things over.

The LEA GROUP serving the Finishing Field
Lea-Ronal, Inc., Jamaica, N. Y.
Lea-Michigan, Inc., Detroit
The Lea Mfg. Co., Waterbury, Conn.
Lea Mfg. Co., of Canada, Ltd.
Lea Mfg. Co., of England, Ltd.
Plating Polishing Buffing Burring

Lea-Ronal Inc.

Sales and Manufacturing Plant: 227 East Aurora Street, Waterbury 20, Conn.
Main office and Laboratory: 139-20 109th Avenue, Jamaica 35, N. Y.

Are you interested in Buffing, Polishing and Burring Specialties? SEE OTHER SIDE OF THIS INSERT.

INDUSTRY NEWS

CIRCO FORMS ULTRASONIC DIVISION

The formation of Circo Ultrasonic Corp., a subsidiary of Circo Equipment Co. has been announced by Melville Morris, president. The newly-formed corporation will manufacture a complete line of ultrasonic cleaning equipment for industrial and other applications. Unit sizes and capacities will vary from small, one gallon units for jewelry cleaning operations to large, industrial installations. Manufacturing facilities will be located in a new wing of the parent company's Clark, New Jersey plant.

Mr. Benson Carlin has been appointed vice president and executive director of the corporation. Mr. Carlin was formerly president of Alcar Instruments, Inc.

TECHLINE OPENS CALIFORNIA WAREHOUSE

New warehouse and processing laboratory facilities have been opened in Pasadena, California, at 2602 East Foothill Blvd., by Techline Division, Wheelabrator Corp., Vicksburg, Michigan.

Complete stocks of wet blasting and barrel finishing equipment and parts will be carried in the warehouse as will stocks of finishing supplies including media, compounds, abrasives and accessories.

FEDERATED METALS MOVES DETROIT OFFICE

The Detroit sales office of Federated Metals Division of American Smelting and Refining Company (Asarco) has moved to 522 New Center Building, 7430 Second Ave., Detroit 2.

ACME MANUFACTURING MARKS 50TH YEAR WITH OPEN HOUSE

As part of the fiftieth anniversary of the Acme Manufacturing Co., this pioneer manufacturer of polishing and buffing machines will hold open house June 15 to 19 at the company's plants at 1400 East Nine Mile Road, Detroit. They will display an extensive operating array of modern finishing machines there, as well as concurrently exhibiting at the AES's Fifth Industrial Finishing Exposition in the Detroit Artillery Armory. It is reported that approximately $300,000 worth of equipment will be shown at their plant.

Special buses will be provided by Acme to transport visitors and guests the five miles from the Armory to its plant.

DIVERSEY CORP. HAS SUBSIDIARY IN ITALY

The Diversey Corp. acquired a new subsidiary in Italy making a total of nine subsidiaries and affiliated companies operating outside of continental United States.

The new subsidiary to be known as Diversey Italiana, S. P. A., stated that it was formed in partnership with Italian and French interests and will operate on a national basis from its headquarters and factory in Milan.

This is the sixth acquisition for Diversey in the past year in its world-wide expansion program.

Last month Diversey purchased Deosan Limited in London, England (owned by Diversey Corp. (United Kingdom) Limited, a wholly owned subsidiary of the U. S. firm) for approximately $800,000 from Vick International Limited.

Diversey now has manufacturing facilities outside of the United States in Australia, Brazil, Canada, England, France, Hawaii, Puerto Rico, Venezuela, as well as Italy.

RESEARCH EXPANSION AT METAL & THERMIT

Plans for expansion of electrochemical research and development activities have been announced by Dr. C. Kenneth Banks, vice president, research, Metal & Thermit Corporation.

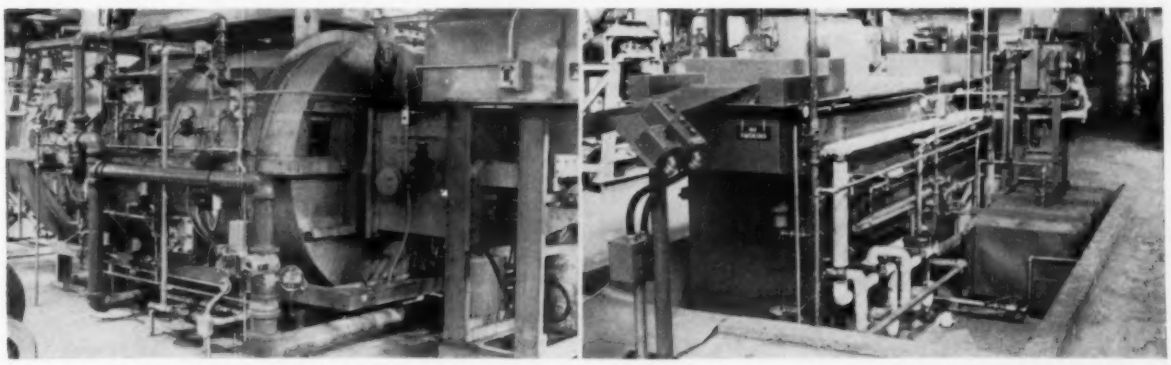
Dr. Banks announced the purchase of previously leased facilities in suburban Detroit for the company's electrochemical research laboratory and pilot plant. "Future plans for this facility," he said, "call for acceleration of existing research programs in chromium, copper, nickel and tin plating, as well as investigations into the plating of other metals. We will add basic research in electrochemistry—the electro-winning and electro-refining of metals, and the electro-production of chemicals."

He predicted that "rejuvenated research in this field is producing developments which we expect will revolutionize bright finishes of metal parts."

H-VW-M NAMES REGIONAL DISTRIBUTOR

Industrial Chemical and Equipment Co., Minneapolis, has been appointed exclusive distributor for Hanson-Van Winkle-Munning Co. in Minnesota, North Dakota, South Dakota and western Wisconsin.

The Minneapolis firm, whose head-



Seymour Manufacturing Co., has entered the stainless steel production field after 80 years of non-ferrous metal manufacture. (Left) Main unit of Seymour's 150-ft electric furnace handles continuous bright annealing at temperatures up to 2150F. (Right) Degreaser for stainless steel strip.

quarters is at 205 Eleventh Ave., South, will continue the distribution of other lines that are non-competitive.

Organized in 1946, Industrial Chemical and Equipment maintains a laboratory facility and specializes in complete finishing plant and process engineering assistance. The company is operated by Robert L. Buckley and Hallick B. Johnson as a partnership.

OAKITE HOLDS ANNIVERSARY SALES CONFERENCE

Forty-five technical service representatives of Oakite Products, Inc., met in New York recently for the company's 50th Anniversary Sales Conference. The conference, third in a series of five regional meetings, brought together the New England, Upstate New York, and Metropolitan New York divisions of the company.

Purpose of the conferences was to enable the men to share their experiences, to inform them of new products, and new projects under study by the company's development laboratories. Of considerable interest at the various technical sessions were refinements in metal phosphating compounds; ultrasonic cleaning; new paint strippers for synthetic finishes.

HALL EQUIPS NEW PLATING PLANT

The C. M. Hall Lamp Co. is equipping its plant at Clinton, N. C., with one of that region's largest and most modern electroplating installations. The new facility will enable the company to expand its production.

The installation will consist of two double-lane, fully-automatic return-type plating machines for copper, duplex-nickel and high-temperature chrome. It will have direct-current amperage and voltage capable of plating 25 sq ft per carrier arm; air-agitated baths and ample filtration capacity.

The equipment and installation work is being furnished by the Plating Service and Equipment Corp., Detroit. Completion is scheduled the latter part of May.

The new installation will quadruple total capacity of the company's plating departments in its main plant at Detroit and an auto-mirror factory at Richmond, Mich. The mirror operations were begun by the Hall Products Division six months ago. These operations will be consolidated in the near future with others at Clinton, where the company now manufactures speedometer and power-transmission cables.

HIGH TEMPERATURE PLATING AT STANDARD PRESSED STEEL

A separate high-temperature plating facility—increasing by five-fold its capacity to finish hot-spot fasteners and structural parts—has been put into operation by Standard Pressed Steel Co., Jenkintown, Pa.

The new unit, costing in excess of $100,000, will apply diffused nickel-cadmium, nickel, copper and silver coatings of a type used on parts for temperatures up to 1400 F.

The move reflects greatly stepped-up demands from the aircraft and missile industries for the higher-heat bolts, including a 200 per cent jump within the year in orders for the relatively low-cost nickel-cadmium plated fasteners.

FRANCIS T. EDDY NOW PARTNER OF BAYSIDE INDUSTRIES, INC.

Francis T. Eddy and Charles C. Wirth have incorporated the Bayside Plating Company to form Bayside Industries, Inc. At the company's new plant on Placentia Ave., Costa Mesa, California opening May 1, the expanded concern will not only continue to offer broad services in custom decorative plating but also in electroplating gold, rhodium, silver, copper, nickel and chromium and in applying chromate, Iridite and other chemical finishes to specifications.

Until recently, Mr. Eddy was president of the Technicraft Laboratories, Inc. of Thomaston, Connecticut. With his wife and son, he has now moved to the West Coast and has established residence in Costa Mesa. National President of the AES in 1957–1958 and possessor of a distinguished record of AES service, he is serving on the Society's current Executive Board as Immediate Past President.

PLATING MAGAZINE

AMERICAN ELECTROPLATERS' SOCIETY

Opportunity to Authors

Member or non-member authors of technical and scientific papers on electroplating, metal finishing and related arts are cordially invited to submit manuscripts of original, unpublished papers to the Editor of PLATING for review and publishing consideration.

Any such paper accepted and published in PLATING will also be eligible, of course, for selection by the Society's Paper Awards Committee for the Carl E. Heussner Award; AES Silver Medal; AES Bronze Medal; George B. Hogaboom Memorial Award; Robert S. Leather Mechanical Finishing Award; Chromium Plating Award; Precious Metal Plating Award, or the John J. Hanney Memorial Award.

So as to expedite review and other processing, please write the Editor, PLATING, 445 Broad Street, Newark 2, New Jersey, for full particulars before submitting your manuscript.

INDUSTRY NEWS BRIEFS

CADMIUM PRODUCTION AND CONSUMPTION DECLINED IN 1958

Cadmium production in the United States in 1958 totaled about 9.53 million pounds, a decline of 10 per cent from 1957, according to the Bureau of Mines, United States Department of the Interior. Fourth quarter output was 2.6 million pounds, the highest quarterly output of 1958; it exceeded the third quarter by 15 per cent. Apparent consumption of cadmium metal was about 8 million pounds compared to approximately 11 million pounds for 1957. Total new supply of the metal approximated 10.5 million pounds.

DU PONT INTRODUCING NEW PRODUCT CLAIMED TO BE METAL COMPETITIVE

In mid-1959, Du Pont will begin commercial manufacture of a new man-made engineering material—"Delrin" acetal resin.

Delrin is said to be a tough, rigid thermoplastic developed primarily for use in fields now dominated by die-cast metals. Over 75 per cent of its potential applications involve replacement of steel, brass, aluminum, and zinc.

Delrin acetal resin is claimed to be extremely rigid without being brittle; tough and resilient, much like spring steel. It is said to retain these properties under adverse conditions of temperature and humidity, during an extended time under stress, and during exposure to most solvents.

It can be fabricated by conventional methods on standard plastics processing equipment at mass production rates. It can be screwed, nailed, sawed, drilled, machined, painted, metalized, printed, etc.

SEYMOUR OBTAINS ADDITION AGENT PATENT

The Seymour Manufacturing Co., Seymour, Conn., has been awarded a patent on CuSOL, its new copper-plating agent. An addition agent for copper bath solutions, it was developed expressly for the electro-formation of molds, dies, and similar components. It is said to give smooth-surface copper-plating to any thickness and the resulting hard plate has a Rockwell test of 75 on the "F" scale.

SEL-REX WINS ADVERTISING AWARD

The New Jersey Chapter, National Industrial Advertisers Association, awarded the "first honors certificate of distinction for excellence in their Direct Mail Program" to G. S. Corigliano, manager, advertising and sales promotion, Sel-Rex Corp., Nutley, N. J. The imaginative campaign which won the award consists of a series of full-page, newsletter-type advertisements entitled "Plating Progress," which was reprinted on a specially designed self-mailer, and sent to a mailing list of the metal finishing industry.

"Plating Progress" was termed outstanding for its "off-beat" carteon cover. The self-mailer also featured a built-in reply card with a listing of the firm's technical material.

TIN RESEARCH REPORT CITES NEW TECHNIQUES

The annual report on the work of the Tin Research Institute mentions many newly discovered facts about tin, its alloys, and chemical compounds.

Reports are made on solderability of various coatings on metals, and methods for improving the quality of tinplate. The significance of porosity in tin coatings is being studied by new methods. Tin-nickel plating is now being taken up by watch and instrument industries.

The Institute continued its free technical advice services to firms and individuals all over the world.

Brass Plating Control

●

Brass plating is one of the few solutions in which color is important and changeable. Anyone who cares to read can find much reference to color control of brass plate. Much of this is contradictory and even the valuable information is hidden among useless information.

●

True Brite Brass Materials are the answer to this lack of control. The information on brass plating operation in our bulletins is accurate and concise. The best proof of real control is the ability to plate and match the higher copper brasses (bronzes). This can be done in both still tanks and barrels. And only True Brite can give you the complete package. We have the operating information, the methods, of analysis and the maintenance materials that really keep you on the beam. No matter whether you're the electroplating engineer, the plating foreman or the executive in charge we can help you. All we want is a chance to prove this to you. The biggest companies in brass plating are using our materials and tell us how satisfied they are. Maybe you're missing out because you're not aware of the real savings you can make and the satisfaction that comes from doing a good job consistently.

TRUE BRITE CHEMICAL PRODUCTS CO.
98 FALLS AVENUE OAKVILLE, CONN.

USE READER SERVICE CARD; INDICATE A 524.

PATENT ABSTRACTS

DR. D. GARDNER FOULKE
Manager, Electrochemical Development
Hanson-Van Winkle-Munning Co.
Matawan, New Jersey

Copies of patents may be obtained by writing to Commissioner of Patents, Washington, D. C. Price 25 cents each.

No. 2,859,146, 11/4/58—Treating Galvanized Metal—A. Prust, assignor to Republic Steel Corp., Cleveland, Ohio.

Claim 1 reads: "The method of treating a galvanized metal surface to inhibit wet storage stain which comprises exposing the surface to a dilute aqueous solution of borax and phosphoric acid, containing sodium nitrite in amount of at least about 0.1 per cent, the borax being in greater amount than the phosphoric acid, and drying the treated surface."

6 claims, 1 figure.

No. 2,859,148, 11/3/58—Producing Boehmite Layer on Aluminum Foils—D. Altenpohl, assignor to Aluminum-Walzwerke Singer GmbH, Singer, Germany.

Aluminum foils to be used in electrolytic capacitators are washed after etching in at least one bath of distilled water at a temperature below 75C followed by subjecting the foil to a distilled water bath at a value below a *p*H of 7 at a temperature of 75C to boiling for a time sufficient to obtain a boehmite layer of a thickness of 0.02 to 0.1 micron. In the discussion it is stated foil so treated can be held for years before forming the dielectric film thereon.

2 claims.

No. 2,859,157, 11/3/58—Apparatus for Plating Interior Surfaces—John Curtiss Jr., Belmont, Calif.

An apparatus for plating interior surfaces wherein the solution is passed through a centrally disposed anode is claimed.

14 claims, figure.

No. 2,859,158, 11/3/58—Nickel-Chromium Diffusion Alloy—G. Schaer, assignor to USA (Navy).

Plate molybdenum articles with 0.00025 in. chromium, then 0.00075 in. nickel, repeating a plurality of times, then heat to a temperature above 980C for 4 hr.

2 claims, figure.

No. 2,859,159, 11/3/58—Bright Copper Plating—C. Wernlund, assignor to Elechem Corp., Jersey City, N. J.

A bright copper plating bath containing as brighteners 0.010 to 0.2 g/l of trivalent antimony and a metal chosen from zinc (0.056 to 2.32 g/l), arsenic (0.76 to 7.6) cobalt (0.003 to 0.32 g/l to 0.4 g/l) iron (0.088 to 0.4 g/l) and cadmium (0.007 g/l to 7.0 g/l).

6 claims.

No. 2,859,512, 11/11/58—Bonding Titanium to Ceramics—P. Hovingh, assignor to North American Philips Co. Inc., New York, N. Y.

Place a metal layer (Ni, Fi, Co) 5 μ to 10μ thick between the two surfaces and heat in vacuum.

1 claim.

No. 2,860,089, 11/11/58—Zinc Plating—J. Jackson, assignor to R. O. Hull and Co., Rocky River, Ohio.

Additions to cyanide zinc baths are described as polyvinyl alcohol (0.0½–0.4 g/l) and a bath soluble polyepoxyamine.

2 claims.

No. 2,860,092, 11/11/58—Electropickling—A. Hart and G. Kamm, assignors to American Can Company, New York, N. Y.

Claim 1 reads:

"A method of high speed cleaning and deoxidizing a ferrous metal surface, comprising passing said surface between induction coils, heating said surface to a temperature of about 500 to 550F in about .25 to 1 sec by means of said coils, immersing the thus heated surface in an aqueous HCl solution for about from 2 to 4 sec, said solution containing 15 to 20 per cent by weight of HCl and being maintained at a temperature of from 110 to 150F making said surface one electrode in an electrochemical circuit, and passing an alternating current having a current density of from 500 to 2000 amp/sq ft through said solution whereby said surface is cleaned and deoxidized by an electropickling action."

No. 2,860,098, 11/11/58—Metal Coating—F. Fahnoe and J. Shyne, assignors to Vitro Corp. of America, Verona, N. J.

The deposition of oxides of metals (Cr, Ni, Fe, Ag, Cu) and chromium and zirconium flurides electrophoretically on a base metal is claimed.

9 claims.

No. 2,860,099, 11/11/58—Lift Arm Assembly—James Barton, assignor to F. B. Stevens, Inc., Detroit, Mich.

A lift arm assembly for a plating conveyor (barrel) is described.

5 claims, figure.

No. 2,861,015, 11/18/58—Descaling Titanium—R. Simon, assignor to North American Aviation, Inc.

Immerse the titanium workpiece in an aqueous bath consisting of 40 to 55 weight per cent of sodium hydroxide, 1 to 1½ per cent of chromate (chromic acid and Na^+ and K^+ salts), then immerse in an acid bath to remove the scale.

6 claims.

No. 2,861,016, 11/18/58—Battery Acid—J. Machool, assignor to Gould National Batteries, St. Paul, Minn.

The addition of silver sulfate to 1.20 sg sulfuric acid is claimed.

1 claim.

No. 2,861,019, 11/18/58—Chromate Coating Magnesium—H. DeLong, assignor to the Dow Chemical Co., Midland, Mich.

An article containing at least 85 per cent magnesium can be coated in an aqueous bath containing 0.25 to 3.0 per cent of chromic acid and a sulfate (HH_4^+, H^+, alkali metal, alkaline earth metal) to provide SO_4 corresponding to 0.1 to 0.3 per cent ammonium sulfate based on weight of the solution. The *p*H is given as 0.9 to 1.8.

12 claims.

No. 2,861,029, 11/18/58—Printed Circuits—L. Bain and R. Geshner, assignors to Western Electric Co., Inc., New York, N. Y.

The method consists of steps: lay down resist on a metal foil bonded to phenol fiber board, gold plate, remove resist, cover gold with resist, etch metal foil.

1 claim.

No. 2,861,906, 11/25/58—Metal Treatment—L. Schuster and A. Baldi, assignors to Kelsey Hayes Co., Detroit, Mich.

A treatment for ferrous surfaces wherein the surface is etched in nitric acid (1–20 per cent) for 2 to 70 sec after activating (sulfuric acid mentioned in claim 4), then an aqueous film of partially reduced chromic acid is laid down and finally dried.

6 claims.

No. 2,861,927, 11/25/58—Treatment of Aqueous Alkali Cyanide Electrolytes—M. Ceresa and J. Crain, assignors to Westinghouse Electric Corp., E. Pittsburgh, Pa.

To remove carbonates from cyanide electrolytes add a composition consisting of 9 to 91 per cent of calcium cyanide and 91 to 9 per cent of calcium oxide. (See also No. 2,861,928 with 4 claims.)

4 claims.

No. 2,861,929, 11/25/58—Copper Plating—D. Martin and A. Parker, assignors to E. I. du Pont de Nemours and Co., Wilmington, Del.

The use of 0.025 to 0.5 g/l of the sodium salt of methylene-bis-α naphthalene sulfonic acid and 10 to 250 ppm of selenium as selenites and selenates as addition agents to cyanide copper.

3 claims.

No. 2,861,930, 11/25/58—Electrolytic Polishing—H. Robinson, assignor to A. O. Smith Corp., Milwaukee, Wis.

Claim 1 states:

"In an electrolytic bath for polishing metal and containing a mixture of ortho phosphoric acid and a mineral acid selected from the group consisting of sulfuric acid and hydrochloric acid, a salt of alginic acid dispersed within the bath in an amount of 0.10 to 5.0 per cent by weight of the bath."

No. 2,861,931, 11/25/58—Electrolytic Etching—J. Faust, assignor to Westinghouse Electric Corp., E. Pittsburg, Pa.

Silicon bodies can be etched in 1 to 30 per cent hydrofluoric acid containing a hydrophilic solvent (mono- and polyhydric alcohols, ethers, carboxylic acids, amines ester and ketones) by making said body the anode.

5 claims.

No. 2,861,935, 11/25/58—Electrophoretic Method—F. Fahnoe and James Shyne, assignors to Vitro Corp. of America, Verona, N. J.

Metallic oxides and a lubricating agent (sulfides, tellurides, etc. of Mo, W and Ti) are electrophoretically deposited on a metal then treated in a reducing atmosphere.

4 claims.

No. 2,861,936, 11/25/58—Electrodeposition Apparatus—D. Colasanto, assignor to Radio Corp. of America, Del.

An apparatus for plating connector wire portions extending from one face of a disc type stem assembly is described.

2 claims.

No. 2,861,937, 11/25/58—Electropolishing Apparatus—J. Jumer, Chicago, Ill.

An apparatus for electroplating the interior surface of vessels is described.

10 claims.

No. 2,862,839, 12/2/58—Removing Oxides from Strip—E. McHenry, assignor to Allegheny Ludlum Steel Corp., Brackenridge, Pa.

The apparatus for continuously treating strip, particularly titanium and zirconium, in molten caustic or caustic-salt baths, is modified to include two cooled idler rolls which tend to pick up oxides falling into the bath instead of allowing them to be carried into the acid pickle.

7 claims, 2 figures.

Finest Finishes Reflect
SEELEY
Buffing Compounds

Yes, from Aluminum to Zinc, Seeley's first in fine finishes! Check your special buffing problem with Seeley's expert Metal Finishing Clinic —and give your products the finer look they deserve.

BAR, LIQUID, GREASELESS, and LIQUID-GREASELESS COMPOUNDS

Free SAMPLE ... sent or brought by our representative on request. Be sure to specify type of wheel, metal and operation.

E. E. SEELEY COMPANY, Inc.
P. O. Box 883 . . . Bridgeport 1, Conn.

USE READER SERVICE CARD; INDICATE A 525.

ANODES
UNIVERTICAL
High Purity
•
Be Ahead of the Rest
GET THE BEST!
•
You Can Be Sure Of
QUALITY
SERVICE
and VALUE
ANODES

Virgin Metals Used Exclusively

UNIVERTICAL
FOUNDRY AND MACHINE COMPANY
14841 Meyers Rd., BRoadway 3-2000, Detroit 27, Mich.

USE READER SERVICE CARD; INDICATE A 526.

ARTICLE REFERENCES

By
WILLIAM TUCKER
Eastman Kodak
Rochester, N.Y.

Most of the articles listed here may be obtained by writing to the publications in which the articles were published. Addresses are given at the end of the references for the reader's convenience.

Photostat or microfilm copies of articles in available magazines may be obtained from: Library of Congress, Washington, D. C.; New York Public Library, New York; Engineering Societies' Library, New York, at prevailing rates. In other cases, consult Wilson's Union List of Serials at your nearest public library for other sources of these articles.

50. ADHESIVES

a. *PICK THERMOSETTING ADHESIVES FOR STRONGEST BONDS.*
The Iron Age, *83*, No. 10, March 5, 1959, pp. 79–83.

b. *THERMOPLASTICS: LOWEST COST FOR MILDER SERVICE.*
The Iron Age, *83*, No. 10, March 5, 1959, pp. 84–85.

c. *THERMOSETTING-THERMOPLASTICS FILL THE MIDDLE RANGE.*
The Iron Age, *83*, No. 10, March 5, 1959, pp. 86–87.

d. *TAILOR YOUR METHODS TO THE JOB.*
The Iron Age, *83*, No. 10, March 5, 1959, pp. 88–90.

51. ANALYSIS

a. *RAPID DETERMINATION OF COPPER AND ZINC IN BRASS SOLUTIONS.*
R. C. Armét.
Electroplating and Metal Finishing, *12*, No. 2, February 1959, pp. 56–57.

52. CORROSION

a. *THE DETERIORATION OF ANODISED ALUMINIUM EXPOSED TO CORROSIVE ENVIRONMENT.*
J. M. Kape.
Electroplating and Metal Finishing, *12*, No. 2, February 1959, pp. 41–46.

b. *GENERAL AND INTERGRANULAR CORROSION OF AUSTENITIC STAINLESS STEELS IN ACIDS.*
Michael A. Streicher.
Journal of the Electrochemical Society, *106*, No. 3, March 1959, pp. 161–180.

c. *A CRITICAL ANALYSIS OF PITTING CORROSION.*
N. D. Greene and M. G. Fontana.
Corrosion, *15*, No. 1, January 1959, pp. 41–47.

d. *AN ELECTROCHEMICAL STUDY OF PITTING CORROSION IN STAINLESS STEELS.*
N. D. Greene and M. G. Fontana.
Corrosion, *15*, No. 1, January 1959, pp. 48–54, and pp. 55–60:
Part I—Pit Growth
Part II—Polarization Measurements

e. *COPPER-NICKEL-CHROMIUM AND CORROSION PROTECTION.*
A. H. Du Rose and W. J. Pierce.
Metal Finishing, *57*, No. 3, March 1959, pp. 44–50, 54.

53. ELECTROPLATING

a. *COMPOSITION AND APPLICATION OF ANODES. PART II.*
D. J. Fishlock.
Metal Finishing, *57*, No. 3, March 1959, pp. 55–59.

54. EMBRITTLEMENT

a. *HIGH-STRENGTH STEEL CAN BE CADMIUM PLATED WITHOUT EMBRITTLEMENT.*
D. J. Cash and W. Scheuerman.
Metal Progress, *75*, No. 2, February 1959, pp. 90–93.

55. FINISHING

a. *HOW TO POLISH AND BUFF ALUMINUM.*
Products Finishing, March 1959, pp. 54–66.

56. MISCELLANEOUS

a. *INVENTIONS AND PATENTS.*
Arthur H. Seidel.
Metal Finishing, *57*, No. 3, March 1959, pp. 51–54.

57. ORGANICS

a. *HOW TO SPECIFY A PAINTED FINISH.*
Allen E. Heyson.
Metal Finishing, *57*, No. 3, March 1959, p. 60.

b. *IMPROVED FLUORESCENT PAINTS EXPAND THEIR ENGINEERING USES.*
Norman I. Gaynes.
Metal Finishing, *57*, No. 3, March 1959, pp. 62–63, 65.

c. *WATER-DISPERSED PAINTS FOR PRODUCTS FINISHING.*
M. C. Carpenter.
Products Finishing, March 1959, pp. 28–33.

58. PICKLING

a. *PRECAUTIONARY PROCEDURES IN CHEMICAL CLEANING.*
Robert A. Stander.
Corrosion, *15*, No. 1, January 1959, pp. 33–35.

59. THEORETICAL

a. *CRYSTAL GROWTH OF ELECTRODEPOSITED ZINC. AN ELECTRON DIFFRACTION AND ELECTRON MICROSCOPIC STUDY.*
Ryoitiro Sato.
Journal of the Electrochemical Society, *106*, No. 3, March 1959, pp. 206–211.

60. WASTE TREATMENT

a. *TREATMENT OF EFFLUENTS IN THE METAL FINISHING INDUSTRY.*
Dr. Richard Justh.
Electroplating and Metal Finishing, *12*, No. 2, February 1959, pp. 47–50.

b. *TREATMENT OF PLATING WASTES BY ION EXCHANGE.*
R. F. Heidorn and H. W. Keller.
Products Finishing, March 1959, pp. 72–77.

Corrosion
National Association of Corrosion Engineers
1061 M & M Bldg.
No. 1 Main St.
Houston 2, Texas

Electroplating and Metal Finishing
15 Udney Park Rd.
Teddington, Middlesex
England

The Iron Age
Chestnut and 56th Streets
Philadelphia 39, Pa.

J. Electrochemical Society
1860 Broadway
New York 23, N. Y.

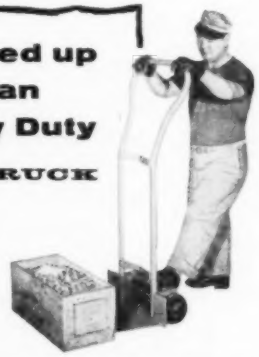
J. Institute of Metals
17 Belgrave Square
London, S.W. 1, England

Metal Finishing
381 Broadway
Westwood, N. J.

Metal Progress
American Society for Metals
7301 Euclid Avenue
Cleveland 3, Ohio

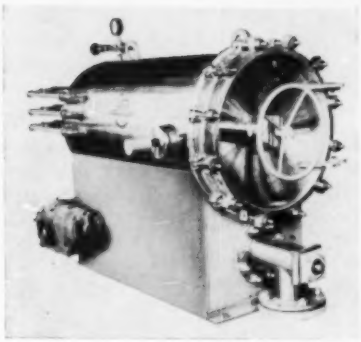
Products Finishing
431 Main St.
Cincinnati, Ohio

Zialite
Reg. U. S. Pat. Off.
for NICKEL PLATING
The one bath especially designed for plating DIRECTLY on ZINC, LEAD, ALUMINUM, BRASS, COPPER and IRON. TREMENDOUS THROWING POWER.
for HARD CHROMIUM
USE Zialite ADDITION AGENTS
Harder CRACK FREE deposits. Increased throwing power. Less sensitivity to sulfate content. Exceptionally fine results plating anything calling for Decorative or Hard Chrome.
ZIALITE CORPORATION
92 Grove Street Worcester 5, Mass.

Tote boxes picked up like magic with an Economy Heavy Duty
SHOVE-L-TRUCK
Milled-edge heavy blade shoves under load without you touching box. Six models, priced from $34.00 to $44.00. Write for new bulletin.

ECONOMY ENGINEERING
ECONOMY ENGINEERING CO.
4529 W. Lake St., Chicago 24, Illinois

EQUIPMENT AND SUPPLIES

Use the convenient Reader Service Card to obtain additional information on any of these items



E—501. Filter—A new type diatomite filter that is said to combine the cake stability of a horizontal plate with dry cake automatic discharge has been made available by the Sparkler Mfg. Co.

This filter known as the Model HR is a totally enclosed pressure type that can be cleaned with complete cake removal without opening the filter, it is reported. The plates are precoated and operate in a horizontal position, to assure cake stability without danger of cracking or slipping.

E—502. Motorized Barrel—Barrel-type processing and plating are now automatic with the new motorized barrel and carrier contacts announced by Abbey Process Automation, Inc.

Designed for use in the firm's automatic processing and plating systems, the electrical contacts for rotating power and processing currents are made and broken by the system to duplicate the decisions and movements of skilled operators, according to the company.

E—503. Push Button Station—A new pendant push button switch with Neoprene housing which features waterproof, non-corrosive, lightweight construction has been introduced by the Electrical Products Division of the Joy Manufacturing Co.

The push button station is available in either 3 or 4 button models. Special grommets are supplied with each unit to fit several cable sizes and assure weathertightness.

Applications include hoist and crane operations, suspension above heavy factory machinery, and any other area where light, non-bulky, weathertight pendant-type stations are desirable.

E—504. Corrosion Test Cabinet—A new line of corrosion test cabinets has been introduced by G. S. Equipment Co.

Operating currents are 110v or 220v/ single phase/3.5 kw. (optional), 220v, 440v, or 660v/3 phase/with 110v control. These cabinets permit testing of such large items as auto bumpers, steering assemblies, and complete engines intact without cutting apart or dismantling into sections requiring separate tests. Test results are always within 10 per cent of absolute duplication according to the company.

The new, big cabinets are either stainless or mild steel, all-welded, epoxy lined and uniformly heated throughout by full-coverage water jackets on all four sides and bottom.

E—505. Spindle Machines—Techline Division of Wheelabrator Corp. announces a new line of vertical spindle machines for precision finishing of parts which are not adaptable to conventional barrel finishing methods.

Manufacturing rights to spindle fixture equipment have been purchased by the organization from John Wisler, original designer of the equipment. Techline designs will incorporate certain refinements and modifications to promote uniform deburring and radiusing of high precision parts at accelerated rates of production, and with increased ease of operation and work handling.

The machines are furnished in models incorporating 4, 8, and 16 spindles, with power drives ranging from 5 to 30 hp.

E—506. Titanium Centrifugal Pump—Centrifugal pumps and valves made of commercially pure titanium are now being manufactured by the Duriron Co. Mallory-Sharon Metals Corp. worked with Duriron's engineers on welding and fabrication techniques.

This equipment was designed in titanium specifically for the highly corrosive environments found in chemical plants.

The pumps will be available in sizes from one by one in. and capacities from ½ gpm.

E—507. Silicon Rectifier—Designed to replace Type 866 mercury vapor rectifier tubes, high voltage silicon cartridges manufactured by International Rectifier Corp. provide ⅔ reduction in space and weigh less than 1/10 of equivalent tube circuitry, according to reports.

Rated at 6,400 PIV, these units will provide dc output currents of 250 ma at 75C ambient temperature.

The entire housing and cooling fins of these multiple junction, hermetically sealed cartridges acts as a heat exchanger to dissipate the inherently low internal power losses of silicon.

E—508. Steam Boiler—The Sellers Type H boiler is designed to provide steam for a great variety of industrial and commercial uses such as plastic molding and tire vulcanizing, in laboratories and other establishments.

The boiler is said to operate economically with no wasteful low fire throttling; burners are full "on" or "off". An electric mercury tube type pressure switch automatically closely holds desired operating pressure; there is constant steam pressure.

E—509. Water and Waste Nomographs—Two nomographs—one on the value of recovered water and the other on the amount of waste chemical which can be recovered—have been released by Graver Water Conditioning Co.

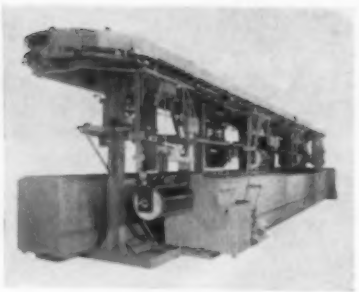
To use the nomograph on recovered water, one must know the cost of makeup water in cents/M gals, and the average flow through the plant. The recovered water value is obtained by drawing a straight line on the nomograph.

To use the nomograph on recovered chemical, it is necessary to know the amount of recoverable chemical in ppm and the volume of waste water in gals/day.

E—510. Blast Cleaning Cabinets—Versatility and adaptability are claimed for spinner hanger airless blast cleaning cabinets produced by Wheelabrator Corp.

The cabinets are designed to meet the cleaning needs of users whose production rates outstrip the capacity of standard blast equipment but are not sufficiently large to warrant installation of high production equipment such as monorail blast cabinets.

Each machine is designed for a specific cleaning application. The essential features are compartmented work areas, spinner devices for rotating the work while it is blasted, airless blast units, and work-carrying fixtures.



E—511. Automatic Processing Conveyor—The new Crown M-P (multi-purpose) conveyor can carry on several process jobs simultaneously. The conveyor lowers production costs by eliminating down time for change-overs and increasing the speed and scope of processing in plating, anodizing, painting, phosphatizing and rubber dipping operations, according to Crown Rheostat and Supply Co.

Features of the machine include ability to plate two or three different metals and work can be plated at four different thicknesses at the same time.

E—512. Cold Stripper—The Lea Manufacturing Co. announces a new high speed stripper—Coldstrip No. 900—for removing at room temperature enamels, lacquers, and the newer resin base coatings such as the epoxy resins, vinyls, acrylics and others. The stripper is usable in a steel, glass-lined or ceramic tank.

E—513. Stainless Steel Filter—The new SS7.5C Fulflo filter, made with a durable one-piece shell of type 316L stainless steel, is designed for operating pressures up to 750 psig. It is recommended by the manufacturer, Commercial Filters Corp., for all operations requiring minimum chemical reaction between the filter and liquid or gas being filtered. Numerous applications include compressed air, gases, hydraulic fluids, liquid fuels, liquid chemicals, lubricating oils and water.

the V-notch

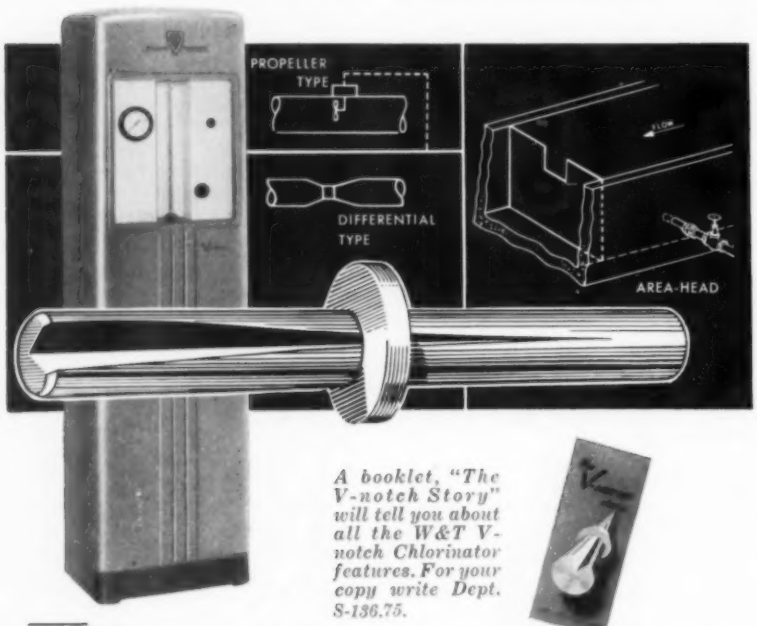
ready and waiting for your signal

Lots of jobs are done better automatically. Changing chlorine feed rate is now one of them. With the V-notch...the straight line metering action of the plug through the ring makes automation simple.

Merely by adding, not adapting, a W&T V-notch Chlorinator can give you any degree of automatic control you want—step rate, start-stop, program, proportional, even residual control.

With a V-notch Chlorinator any signal from any primary metering device can control chlorine feed. So anyone can afford automation.

And, of course, the right plastics make the whole chlorinator chlorine-proof.



A booklet, "The V-notch Story" will tell you about all the W&T V-notch Chlorinator features. For your copy write Dept. S-136.75.

WALLACE & TIERNAN INCORPORATED

25 MAIN STREET, BELLEVILLE 9, NEW JERSEY

E—514. Spotting Preventative—Entek 45, a liquid additive to hot water rinses which reportedly prevents spotting and subsequent corrosion of all metals, has been developed by Enthone, Inc. The new product causes rinse water to shed rapidly from the metal surface resulting in faster drying and elimination of water spots and stains. At the same time, it is said to leave a strongly adsorbed, invisible film on the metal surface which protects it from tarnishing and corrosion for months.

It may be used after plating, pickling, or chemical processing.

E—515. Belt Grinders—A complete line of low-cost 2¼-in. belt grinders has been introduced by Rockwell Manufacturing Co.'s Walker-Turner Division.

The new line is designed for fast, efficient grinding, buffing and deburring in commercial metalworking shops, plant maintenance shops, tool rooms and other industrial areas, according to the company.

In addition to the four standard setups, a variety of accessories are available which make it possible to build special job setups.

E—516. Hard Chrome Application—Savage-Rowe Plating Co., recently announced development of a process for selectively hard chrome plating of lands on diesel pistons, to a controlled thickness and uniformity, as a means of preventing wear on new pistons and salvaging worn ones. One engine manufacturer has pistons so processed under test.

E—517. Rotary Automatic—Hammond Machinery Builders has introduced their Model J21-4 rotary indexing turret, designed to produce high quality finishes at cost, according to the company.

This machine may be used with one, two or three polishing, buffing or deburring heads as required to produce a desired finish.

The model incorporates all the features of the standard rotary automatics, has an operating range of 250 to 600 indexes per hour and requires four workholding fixtures.

E—518. Plating Process—Poorly polished steel, dull copper plate, unbuffed stampings and castings can now be protected with a bright, smooth nickel coating by a new plating process introduced by American Smelting and Refining Co., it is claimed. The new technique, the Levelmax process, joins zinc and cadmium processes.

It reportedly produces a protective surface with outstanding brightness, ductility, adhesion and leveling characteristics and is simple to control and maintain.

E—519. Portable Filter—The new model of the Pre-Met portable solution filter announced by Sel-Rex Corp. features a rotating magnetic field to drive the pump impeller, eliminating the need for seals or

stuffing glands. This innovation reportedly makes the filter leak-proof, eliminating costly solution loss in the filtration of precious metals electrolytes.

The filters utilize a canned turbine pump which is continuously lubricated by the solution being processed.

E—520. Chemical Blanket—Amchem Products, Inc. announces their Serseal chemical blanket now available for use on acid pickling baths.

With the use of the process in conjunction with acid pickling baths, heating requirements are reduced up to 70 per cent, and working conditions greatly improved, according to Amchem.

Additional advantages claimed are little or no fuming; less corrosion of surrounding equipment and building; elimination or reduction of maintenance of venting equipment.

E—521. Stripper Additive—A new additive, designed to enable alkaline paint stripping solutions to remove difficult synthetic finishes, has been developed by Oakite Products, Inc.

Known as Oakite stripper additive No. 4, the new product is a solvent. It converts a narrow-range stripping solution

TWO TESTS SHOW

Redline®

BUFF CLOTH

GIVES UP TO 20% INCREASE IN BUFF LIFE

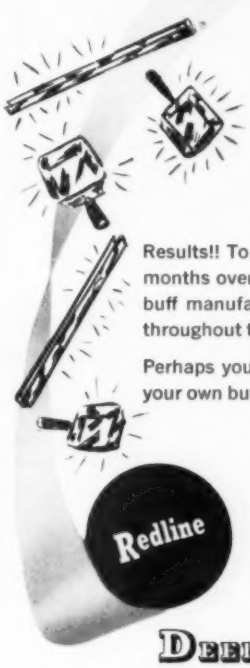
Test I — Square aluminum skillets—Semi-automatic machine 20" x 7" center 18 ply.

REDLINE performed well with the same compound used on unbleached cloth.

Continued to cut well, to a smaller diameter than the previous cloth. About a 20% increase in buff life.

Test II — Aluminum shower door strips—Hand buffing 16" x 7" center 16 ply.

REDLINE cuts better, was stiffer than unbleached 86/93 Company claimed that REDLINE lasted twice as long.



Results!! To what extent has Redline been successful? In the last six months over one half million yards of Redline has been purchased by buff manufacturers. Buffs of Redline cloth are being used in plants throughout the country on work ranging from silver to zinc die castings.

Perhaps you would like to check Redline's cost/performance ratio in your own buffing operation? We suggest that you ask your buff supplier to prepare a test lot of buffs made with Redline cloth in the size and design you need. In this way you can check Redline yourself to see how it can improve your buffing performance.

Redline is a trademarked fabric. Together with Types 160, 190 and Wearon, it comprises the Milliken line of "Fabrics Engineered for Buffs".

DEERING, MILLIKEN & CO., INC.

1045 SIXTH AVENUE • NEW YORK 18, N.Y.

See our exhibit at AES Meeting

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 530.

For any non-ferrous* buffing job . . .

SLOW SPEED

MEDIUM SPEED

HIGH SPEED

Get top results with a job-matched STEVENS TRIPOLI

There's a Stevens Tripoli for every kind of buffing operation . . . slow, medium, and high-speed hand-buffing as well as automatic machines. Ten grades take care of them all – perfectly. Take these factors into consideration, and you can't go wrong: the type of material to be buffed, the operating speed and pressure, and the method of cleaning. Give us the information, and we'll advise you on the Stevens Tripoli grade that will work best for you. Ask your local Stevens sales representative, or write direct to us.

**including hard plastics.*

frederic b. STEVENS, inc.

DETROIT 16, MICH.

BUFFALO CHICAGO DETROIT CLEVELAND DAYTON NEW HAVEN INDIANAPOLIS SPRINGFIELD (OHIO)

into a wide-range solution capable of removing epoxy, acrylic, and similar tough finishes.

The use of this additive, according to the manufacturers, makes it possible to salvage rejects economically, and to remove paint build-up from hooks, spray booth filters, and other equipment used in the painting operation.

E—522. Portable Solution Filter—Industrial Filter and Pump Mfg. Co. has announced the development of a low-cost, portable plating solution filter which can be moved from one electroplating tank to another.

The type 118 filter is mounted on rubber

tired wheels and is designed to provide 600 gph flow capacity and up to 20 sq ft of filtration area. Because it is connected directly to plating tank, the unit can, say the manufacturers, eliminate piping and valves between tanks and the need for separate filter stations throughout the plant.

E—523. Anode Hooks, Baskets—Commercially pure titanium anode hooks and baskets, with reportedly high corrosion resistant qualities, have been developed for the plating industry by Mallory-Sharon Metals Corp.

Both are available in standard sizes and shapes. Standard titanium hooks range in size from 3½ to 8 in., with special sizes on request.

The hooks and baskets are said to have an indefinite life in highly corrosive mixtures. Because of the corrosion resistant qualities of the titanium, the hook can be submerged beneath the surface of the acid, allowing even dispersion of the nickel, and sharply reducing nickel scrap and recovery costs, it is claimed.

PREVIEW OF FUTURE PLATING MAGAZINE ISSUES

JUNE 1959

GOLDEN JUBILEE. A unique feature issue climaxing the Fiftieth Anniversary observance of the American Electroplaters' Society, PLATING's parent, it will be targeted both for immediate interest to PLATING's global circulation and for long retainment as an AES reference source and as a memento of this year-long observance.

JULY 1959

POST-CONVENTION. An abundant issue carrying not only scientific, technical and practical plating papers and other educational data of substantial readership interest but also much exclusive post-GOLDEN JUBILEE Convention news and features.

AUGUST 1959

Another annual edition of PLATING's widely anticipated WATER AND WASTE TREATMENT issue.

SEPTEMBER 1959

An issue featuring a number of important electroplating and metal finishing articles, plus many features of wide PLATING MAGAZINE readership interest, including an up-to-date copy of the AES's amended Constitution and By-laws, and a financial report covering the fifteen-month period from April 1, 1958 through June 30, 1959.

OCTOBER 1959

Several significant technical and scientific papers will be released in this strong autumn issue, plus many of PLATING's widely anticipated regular features.

NOVEMBER 1959

Third annual edition of PLATING MAGAZINE's popular AIRCRAFT ISSUE, this edition, judging by its blueprint at this stage, looms as one of PLATING's strongest future editions, a worthy follower of expectedly effective SEPTEMBER and OCTOBER 1959 general issues.

DECEMBER 1959

PLATING's always popular Christmas Issue this year implemented by several important innovations.

JANUARY 1960

Another annual edition of PLATING's vaunted "Abrasives and Mechanical Finishing" Issue.

TRADE LITERATURE

L—501. Coated Abrasive Discs—Abrasive Company of America announces the availability of a 4-page illustrated price list on their Magnecoated abrasive discs. These discs are used for standard, general industrial, sheet metal, soft or semi-soft metals, ceramics, glass and wood, and special applications.

The folder contains information on the process, as well as size, grit and pricing data.

L—502. Filter Products—An 8-page bulletin available from TechFab, Inc., describes the products, facilities and services of this firm which offers a complete line of imported and domestic filter cloth, and filter specialty items.

The two-color illustrated brochure includes information on the cloth analysis run on all fabric before shipment.

In addition, there is a section devoted to the fabrics stocked by the company, the physical and chemical characteristics of each, and a list of the filter specialty items which are available.

L—503. Buffing and Polishing Compounds—Hanson-Van Winkle-Munning Co. has published a 20-page bulletin describing the company's buffing and polishing compounds.

More than 150 compounds and their applications are described in the two-color publication. The bulletin presents a selection from the combined lines of H-V W-M and its J. C. Miller Division.

Compounds for buffing and polishing chromium, steel and stainless steel, hard rubber and plastic are described. Liquimatic application equipment and compounds are featured and tripolis and lime for non-ferrous metals are discussed and illustrated in Bulletin No. Co-104.

L—504. Automatic Barrel Equipment—The Udylite Corporation has published a 4-page booklet on its new VIP (variable, intergrated, processing) automatic barrel equipment. Illustrations include a side view of the machine, station control and the machine in up position.

Data on the monorail suspension system, heavy bussing and the motor are given, as well as information on operating details.

L—505. Colorimetric Analyzers—Bulletin 1156-1 entitled "Quantichem Automatic Colorimetric Analyzers" was published this month by Milton Roy Co. It describes the industrial instruments available for colorimetric determinations of trace quantities of substances dissolved in liquid process streams. This bulletin gives details on analyzers for dissolved silica, dissolved oxygen and total water hardness. Schematic diagrams are included as well as descriptions of the pneumatic programmer, unique sample cells and devices for measuring reagent.

L—506. Vertical Steam Boilers—The advantages of vertical steam boilers are described in Bulletin No. 5215 released by Sellers Engineering Co. The Type H features such advantages as simple design, quietness, fully automatic operation.

L—507. Gold Plating—Entitled "Gold for Industry and the Arts," a new data file that answers questions about the uses and methods of gold plating, and many other facts about the industrial and decorative applications of the precious metal, has been prepared by the Chemical Division of Engelhard Industries, Inc.

The twelve-page brochure, is based on the investigations in precious metal plating research conducted by Engelhard Industries' research division. It contains information about the uses of various types of gold—24 kt., light yellow, pink and green gold.

L—508. Aluminum Finishing—The Frederick Gumm Chemical Co. is now offering its latest edition of the Clepo Aluminum Finishing Manual. The reader will find a detailed discussion of many different problems concerning the finishing of aluminum as well as methods and materials for taking care of these problems. Such operations as cleaning, deburring, etching, deoxidizing, descaling, preparation for welding and anodizing are covered; also treatment of corroded stock.

L—509. Buffing Cost Form—A "Buffing Cost Analysis Form" is available from Schaffner Mfg. Co. The program outlines a method for determining compound cost per unit, buff cost per unit and hourly or daily compound and buff usages. Also included is a way to run a product comparison test.

THE UNCHALLENGED LEADER IN THEIR FIELD

FREE! SELF-SELLING 20-page catalog includes Schaffner's Buff 'n Polish Calculator, Speed Chart, Illustrations.

Offers Exceptional Opportunity to Industrial Salesmen of High Caliber

Representing Schaffner

BUFFING WHEELS and COMPOUNDS

FIRST CHOICE OF PARTICULAR BUFFERS everywhere—SCHAFFNER'S finest and most complete assortment of Buffing Wheels, that produce a smooth, lustrous finish . . . superior compounds made of laboratory-controlled materials. New customers of SCHAFFNER are convinced it's the best move they ever made to increased, trouble-free production . . . for the quality, dependability and efficient service that SCHAFFNER is noted for.

NEW SCHAFFNER BIAS BUFFS PROVE A BIG SUCCESS, a terrific seller! Exclusive, new features give more mileage, longer life! YOUR MARKET IS ENORMOUS—woodworking and metalworking shops, factories, rebuilders, jewelry manufacturers—SCHAFFNER is the answer to all buffing and polishing problems . . . your entree to record sales, and with excellent commissions, heavy repeat orders. Write TODAY for complete details, FREE CATALOG, and preferred territory.

SCHAFFNER MFG. CO. Dept. P-6, 21 Herron Ave., Pittsburgh, Pa.

PERSONALS

Gerry P. Mack formerly product manager for stabilizers has been appointed product manager for the entire line of organic chemicals manufactured by Metal & Thermit Corp.

Mr. Mack joined Metal & Thermit in 1955 as director of M&T Laboratories Inc., Carteret, New Jersey, and in 1957 he was appointed product manager of Thermolite heat and light stabilizers for vinyl plastics.

Mr. Mack attended the University of Chicago and Brooklyn Polytechnic Institute. He is an active member of the American Chemical Society, American Society for Testing Materials, the Society of Plastics Engineers, and the Society of Plastics Industries.

In this new position, Mr. Mack will have the responsibility for sales planning and customer service on the company's complete line of organic and organometallic chemicals.

A. H. Kirkpatrick

G. P. Glover

George E. Glover has been named manager of industrial waste department of the Cochrane Corp., Philadelphia, Pa., and will be in charge of the company's activities in industrial waste treatment and special ion exchange applications. Mr Glover is long experienced in the design, application and operation of industrial waste water treatment equipment including that of metal working solutions. He is also an author on this subject and a member of the committee of the American Water Works Association for Underground Disposal of Wastes.

John Zimm has been appointed a sales representative by the Metal Finishing Division of Frederic B. Stevens, Inc., Detroit. Mr. Zimm, who has been in the metal finishing industry since 1947, will represent Stevens in the Cleveland area.

Prior to joining Stevens, Mr. Zimm spent three years with the Acme Manufacturing Co. as a sales and service representative. He worked in a similar capacity for nine years with the Divine Brothers Co. He recently spent considerable time in Germany setting up an automatic polishing and buffing installation for finishing bumpers for Opel cars.

During World War II, Mr. Zimm, spent 33 months in the US Air Force. He is a member of the Cleveland Branch of the American Electroplaters' Society.

Frank W. Welling has been elected vice president of Commercial Filters Corp. He will have broad responsibility for the administration of the company and sales of its products.

For the past four and one-half years, Mr. Welling has served as vice president and director of W. A. Case & Son Manufacturing Corporation, Buffalo. He previously served in a similar capacity with Univis Lens Co., and was also associated with Booz, Allen & Hamilton, Management Consultants, in New York and Chicago. He is a graduate of Northwestern University.

W. James Stevenson has been appointed Western brass mills sales representative in Indianapolis, Ind., for the Metals Division of Olin Mathieson Chemical Corp. He had been a sales representative located in Rochester, N. Y.

Mr. Stevenson is to be in charge of the Indianapolis office located at 150 West Market Street. He has been associated with Olin Mathieson since November 1956.

John P. Nichols of the American Electroplaters' Society is among those public relations practitioners internationally whose backgrounds and long-time records of performance in the profession have earned selection and profiling in the first edition of "Who's Who in Public Relations" just published.

Dr. Howard H. Hurmence's appointment as technical director of Allied Chemical's General Chemical Division has been announced.

Dr. Hurmence succeeds **J. W. Swaine** who has been appointed vice president in charge of research, engineering and construction.

As technical director, Dr. Hurmence will head General Chemical's extensive research and development activities in industrial, agricultural and scientific chemical fields. The Division's major research laboratory is at Morristown, N. J. It also has a development laboratory at Baton Rouge, La.

Emil G. Marcmann, of Collegeville, Pa., has been appointed by Titanine, Inc., as technical representative on the Eastern Seaboard.

Mr. Marcmann received his education at Newark College of Engineering and Stevens Institute of Technology. He was formerly chief engineer and works manager of T. J. Cope Division, Rome Cable Corp.

Arthur H. Kirkpatrick has been named to the sales engineering staff of Crown Rheostat & Supply Co.

An engineering graduate of the University of Michigan, Mr. Kirkpatrick has been associated with the engineering and project sales of automatic plating equipment for the past 14 years. He will cover the Detroit and surrounding trade areas from 2211 Burns Street, Detroit, Mich.

G. P. Mack

L. Oppenheim Jr.

Laurent Oppenheim Jr. of New York City has been elected a director and appointed vice president, finance, of Hanson-Van Winkle-Munning Co. He is also chairman of the finance committee of Resistoflex Corp. and chairman of the executive committee of Greer Hydraulics, Inc.

Eugene G. Evans has been named division sales representative for the American Platinum & Silver Division of Englehard Industries, Inc. He will make his headquarters at the division's office at 174 Georgia Avenue, Providence, R. I. Mr. Evans has had extensive experience in industrial sales in New England.

Norman McAndrew has been appointed factory representative for Schaffner Manufacturing Co. in the Detroit, Michigan Area.

Mr. McAndrew has undergone an extensive training program in the working applications of the Schaffner products. His Detroit Office will be at 12234 Fielding.

C. W. Trautman is appointed manufacturing manager of the George L. Nankervis Co. A pioneer in the field of engine component test facilities, Mr. Trautman will be responsible for all manufacturing in the fabrication of Nankervis test equipment.

Mr. Trautman was formerly manager of test equipment engineering for Bendix Products Division in South Bend, Indiana.

C. W. Trautman

J. A. Kudjus

Joseph A. Kudjus has been named sales engineer in the greater Detroit area for Klem Chemicals, Inc.

Mr. Kudjus has had several years of experience in industrial cleaning and engineering.

Bill Schaaf has been promoted from division sales manager to general sales manager, at Fremont Industries, Inc., Minneapolis. Mr. Schaaf, who has been with the company since it was organized, graduated from the Minneapolis School of Business in 1949. He was previously associated with Sears, Roebuck and Co., and the Occidental Life Insurance Co. He is a member of the American Electroplaters' Society.

B. Schaaf

Dr. S. Siggia

Dr. Sidney Siggia has been appointed manager of central analytical services in New Haven, Conn., for Olin Mathieson Chemical Corp.

Dr. Siggia will be responsible for research analytical work at New Haven for all corporate divisions and will cooperate with research analytical groups at other company locations, supplying new methods and consultation service on analytical problems.

A specialist in analytical chemistry, Dr Siggia had been manager of analytical research and services for General Aniline and Film Corp. He joined that firm in 1944 after receiving his PhD degree from the Polytechnic Institute, Brooklyn, N. Y.

H. Freedman formerly of Electronic Instrument Ltd., England, has joined Milton Roy Co., as product manager. A member of the American Chemical Society, Mr. Freedman is a graduate of the University of London and holds degrees in both physics and chemistry

Leonard W. Mawhinney has received appointment as executive advisor to the president of Metal & Thermit Corp.

Mr. Mawhinney will assist and advise in organization planning and control, aid the president in analyzing and studying various programs, and undertake special assignments.

Previously, he was associated with Ford Motor Co. and Continental Can. His residence is in Riverside, Conn.

Frank H. Dayton has been promoted to the Dayton, Ohio sales office of Hanson-Van Winkle-Munning Co. Mr. Dayton has recently completed the H-VW-M two-year sales trainee program.

Mr. Dayton holds a BA in chemistry from Bucknell University, class of 1954. He is an active member of the American Electroplaters Society. Address of the Dayton office is 53 Park Ave.

F. H. Dayton

J. F. Zievers

James F. Zievers has been appointed president of Industrial Filter & Pump Manufacturing Co.

A graduate of Kings Point Merchant Marine Academy, Mr. Zievers secured his Master's degree in economics and international trade at Northwestern University. He has been associated with the company in sales and executive capacities for eight years and has most recently handled organizational assignments in the company's market research program.

Advertisement

VICE-PRESIDENTS APPOINTED

V. L. RICHARDS F. E. P. GRIGGS

Canadian Hanson & Van Winkle Company Ltd., announces that Mr. V. L. Richards and Mr. F. E. P. Griggs were appointed Vice-Presidents at a recent meeting of the Board of Directors.

Mr. Richards graduated from Queens University in 1932 with a B.Sc. degree in Mechanical Engineering and from McGill University in 1934 with a M.Eng. degree and has been Works Manager of the Company for many years. He will continue to be responsible for manufacturing and engineering.

Mr. Griggs graduated from the University of Toronto in 1934 with a B.A.Sc. degree in Chemical engineering and has been Sales Manager of the Company for several years. He will continue to have responsibility for the Company's sales activities.

BRANCH NEWS

Total AES Branches U. S., Canada Australia, April 1, 1959 — 58.

BALTIMORE-WASHINGTON

Macioce Talks on Pollution Abatement

The March Meeting of the Baltimore-Washington Branch was held March 10 in the Chemistry lecture room, Bureau of Standards, Washington, D.C.

Two new members were elected.

Frank M. Macioce of the Industrial Filter and Pump Manufacturing Co. was the featured speaker of the evening. His subject was "Pollution Abatement as Related to the Electroplating Industry". It was very evident from the questions following Mr. Macioce's talk that the subject is of prime interest to most electroplaters.

Dr. Blum talked briefly concerning the forthcoming technical session to be held April 11. **Arthur Pierdon** reported on the Interim Meeting recently held in Atlanta.

Harold W. Scott
Secretary

BOSTON

Parker Speaks on Subject of Gold

Boston Branch met Thursday Feb. 5, at the Statler-Hilton with President **Wright** in charge. Communications were read concerning the New York Annual Meeting; New Haven meeting; State of Massachusetts, Commerce Digest featuring a picture story on Modern Electroplating Co.; the Annual Meeting in Detroit in June and a communication from **Sam Heiman** on the possibility of a symposium on alloy plating at the 1961 Convention in Boston. **Wayne Martin** discussed the coming Annual on May 2 while **Les Ferguson** of Providence announced an all-day session at Providence on May 16 with a banquet in the evening.

Dr. Edward Parker of Technic, Inc. of Providence, R. I. discussed Gold and Gold Alloys. Early history of gold and gold alloys from 1600 to the 1940 era of precision plating was mentioned and the rapid developments since 1945 were given in more detail. Hardness, surface conductivity and alloying in both acid and cyanide solutions were discussed along with applications to printed circuits, semi-conductors as well as jewelry. The effect of various metals used in alloying together with the variance in plating efficiency as the *p*H of the solution is lowered were discussed in detail.

George P. Swift
Secretary

BRITISH COLUMBIA

Tate Speaks on Corrosion

President **Jim Lee** opened the Feb. 18 meeting with a welcome to our guests.

One new member was welcomed.

Mention was made by our president of the fact that our Branch was doing fairly well regarding new memberships. He suggested that we endeavor to carry out a membership drive and pamphlets which had been sent to us from headquarters have been distributed to the members who thought they may obtain new applicants.

President Jim Lee gave us a short talk on the proper running of a meeting. He touched on the needs for getting definite opinions and on the proper procedure for getting these expressions into action.

President Lee introduced our guest and speaker, **Reg Tate,** materials and process engineer at Canadian Pacific Airlines. The title of his talk was "An Airline Engineer's Viewpoint on Electroplating and Corrosion". His paper was extremely interesting, telling us of the many different and exotic metal alloys which are used in aircraft manufacture and especially of the great problems which are encountered with corrosion. He outlined the causes of the corrosion, how the aircraft people had arrived at ascertaining the cause and the extent of corrosion, and also the measures which had been taken either to correct or defeat further corrosion. Reg also spoke of the role which is played by electroplating and anodizing in several different aircraft applications.

N. A. Shephard
Secretary

BRITISH COLUMBIA

Tour Rubber Plant

The March 18 general meeting of the British Columbia Branch took the form of a plant tour through the facilities of Huntington Rubber Mills Limited in Port Coquitlam.

Doug Armstrong, representing the company, led a group of 26 members and guests around the works. He described, in detail, the various operations of rubber processing; for example, molding of various sized articles, extrusions, coverings and linings. The use of other corrosion resistant materials was also touched upon as well as methods of application. The specialized equipment proved to arouse a good deal of interest among those who attended.

N. A. Shepherd
Secretary

BUFFALO

Polishing and Buffing Explained by Kloman

The March meeting of the Buffalo Branch was held Friday, March 6 at the Niagara Manor, Buffalo, N. Y.

The speaker of the evening was **Charles Kloman,** sales manager, Buffalo Division of the Behr-Manning Co., whose topic was "Polishing and Buffing of Parts Prior to Electroplating . Mr. Kloman's talk was supplemented with two interesting films "Coated Abrasive Belts Speed Metalworking Production" and "Better Offhand Polishing With Coated Abrasives."

The nominating committee for election of officers was announced as **Joe Ruff,** chairman, **Fred Goeckel** and **Chuck Fotheringham.** The Committee announced for the annual summer picnic is **Eric Sampson,** chairman; **Rolland Campbell, Ray Bleckinger** and **Sam Nania.**

Two new members were welcomed.

Branch members welcomed the return of **Ralph Stemmerich** who has been confined due to illness.

Robert E. Lienert
Secretary

CENTRAL MICHIGAN

Hale Demonstrates Buffing Compounds

The Central Michigan Branch held its regular monthly dinner and educational session at the Hotel Hayes in Jackson, Mich., on Tuesday, March 3.

Twenty-two members and guests turned out for dinner and for what proved to be one of the most interesting and informative talks of the year. Speaker for the evening was **Ralph E. Hale** of the **J. J. Siefen Co.** His subject was "Application and Use of Liquid Buffing Compounds."

Actual demonstration of materials through the use of portable equipment brought in for the purpose provided an excellent presentation and explanation of the steps required to get the most benefit from liquid buffing compound use. A rising vote of thanks was accorded Mr. Hale's efforts.

Plans were formalized for the Annual

BRANCH SECRETARIES

Branch News is required of all Secretaries monthly by AES Bylaws. First of the month is Branch News deadline for next PLATING issue. Any items on hand on that date will be carried in that edition. Later arrivals will appear in the issue immediately following. In reporting talks given by speakers before the Branch, please give titles of the talks, the speakers' full identification and any other pertinent information of interest to other Branches and PLATING's broad readership.

Ladies' Night Party to be held at the Hotel Hayes in Jackson, Michigan on May 5.

Nominations for Officers and Board Members, to be elected at the April Meeting were presented to the Meeting by the Nominating Committee.

Homer E. Welch
Second Vice President and Publicity Chairman

CHICAGO

Brenner is Speaker; New Officers Elected

The Chicago Branch held its regular March meeting at the Western Society of Engineers, 84 East Randolph St., on Friday, March 6. The bad weather did not hold back the attendance as a good number of members were present. Five applications for memberships were turned over to the Board of Managers for approval. Ladies-Nite will be held on Saturday, April 11 at the Midwest Country Club, Hinsdale, Illinois.

The following members were elected to office for the Branch: President, **Charles Geldzahler;** 1st vice president, **Matt Dassinger;** 2nd vice president, **Rudy Hazucha;** secretary-treasurer, **Paul Glab,** librarian, **Simon Gary.** The Board of Managers consist of **Scott Modjeska, Russ Haar, Ed. Smith, Marian Lonfield** and **Jay Monawek.** The delegates are **Clyde Kelly,** Paul Glab and Scott Modjeska. The alternate delegates are Russ Haar, Charles Gedzahler and **Larry Hay.**

Librarian **Joseph Corre** introduced the speaker for the evening, **Dr. Abner Brenner,** chief, Electrodeposition Section, U.S. Bureau of Standards. The distinguished speaker has been with the Bureau of Standards since 1930. He has received international acclaim for his contributions to the field and received many honors from the AES for his many fine papers on plating.

The subject of Dr. Brenner's talk was "Recent Researches at the Bureau of Standards". The first work he discussed was the development of plating a satisfactory nickel plate for electrotyping. The Watts nickel was too soft but by using an addition agent, such as benzene disuifonic acid (0.5 gm/l), a good nickel plate was obtained. The nickel had the following desirable properties (1) the hardness was from 250–300 Vickers (2) low stress and (3) could be bent without cracking

Molybdenum, in order to be used at high temperature, must be protected by some other metal such as nickel. Dr. Brenner's group have developed a nickel-aluminum alloy for the protection of molybdenum. The alloy has the following properties: (1) very stable towards oxidation (about 5 times as good as nickel) (2) rather hard (700 Vickers) and (3) doesn't lose its hardness upon heating. The process is as follows: (1) Watts nickel from 1–2 mils is deposited and followed by (2) plating a deposit of aluminum from a fused salt bath above the melting point of aluminum. In this process, a diffusion coating of nickel and aluminum is produced.

The problem of plating tungsten on graphite was accomplished by using a fused salt bath containing tungstic oxide, tungstates and borates at 800–1000C with an inert atmosphere of either argon or helium. A deposit of tungsten can also be obtained by using the gas plating method where (1) tungsten carbonyl or (2) tungsten hexachloride is decomposed on the heated material to be processed. After the technical session, Dr. Brenner presented colored slides (3-D) of his trip to Moscow including a commentary of each slide. After the showing of the slides, a question and answer period followed and Dr. Brenner was given a rising vote of thanks for his excellent presentation.

Christopher Marzano
Publicity Chairman

CINCINNATI

Benner Discusses Leveling

The meeting was called to order by President **Helmich** with 27 members and guests present.

Ray Barry reported that the annual

Easy to Apply RUBBERITE TANK LINING

Just heat to 300°F. and pour

Provides a lasting lining that withstands acids and caustics at room temperatures. A standby of Platers for over 25 years. Effectively protects wood or steel tanks. Easily applied in your own shop—just turn tank on side and fasten board on edge as illustrated. Then heat Belke Rubberite to 300° F. and pour over surface. Surfaces to be coated require no special preparation but should be reasonably clean.

When Rubberite cools, it has characteristics similar to soft rubber. Will not crack, scale, or run in the hottest weather. Write for complete information.

For lining ¼" thick figure 2 pounds per square foot. Send for literature and prices.

Belke MANUFACTURING COMPANY
947 N. Cicero Ave., Chicago 51, Ill.
EVERYTHING FOR PLATING PLANTS

Dawe's
a dependable source for
SODIUM GLUCONATE
and
GLUCONIC ACID

Promptly available in any quantity.
Warehouse stocks across the country.
Dawe's high quality is assured.
Write for technical data and samples.

Dawe's
DAWE'S LABORATORIES, INC.
4800 South Richmond Street
Chicago 32, Illinois

USE READER SERVICE CARD; INDICATE A 534.
USE READER SERVICE CARD; INDICATE A 535.

picnic will be held on Saturday, June 27, at the Sharon Woods Lodge.

The results of the elections were as follows: **William B. Stephenson Jr.,** president; **Earl Leonhardt,** 1st vice president; **Gerry Poll,** 2nd vice president; **Charles Dumont,** librarian; **Dave Kaplan,** secretary; **Gordon Speers,** treasurer.

H. L. Benner of DuPont discussed the aspects of the leveling copper cyanide bath. Mr. Benner's talk was augmented by colored slides which brought out the pertinent details of his discussion. He pointed out the advantages of using periodic reversal and current interruption instead of straight direct current. The effect of impurities and treatments to correct the conditions and a discussion on the proper anodes were covered.

The group then adjourned to the social hour sponsored by the Allied Research Products, Inc., **Ray Barry** host.

David L. Kaplan
Secretary

CLEVELAND

Dr. Brown Presents Paper on Corrosion

The Cleveland Branch held its March 6 meeting at the Cleveland Engineering Society Building. **Gordon Carlson** introduced the speaker of the evening, **Dr. Henry Brown,** director of research at the Udylite Corporation. He discussed the corrosion problems encountered in plated materials and stressed the point that no two corrosion problems are exactly alike. Environment and the exact nature of the plating process are important factors in determining how a given material will withstand corrosion. He also pointed out the difference between lateral corrosion and the pitting type corrosion.

President **Bob Peters** conducted the business meeting. Two new applicants for membership were elected. Gordon Carlson has arranged for a plant visitation in May to the Ford plant.

Burt Lupien, chairman of the nominating committee, presented the new slate of officers. This slate along with one other candidate, nominated from the floor, will be voted upon by ballot.

George A. Shepard
Assistant Librarian

COLUMBUS

Tour Battelle Nuclear Research Center

The regular monthly meeting of the Columbus branch AES was held on Friday, February 6, at 3:00 pm in conjunction with a tour of the Battelle Nuclear Research Center at West Jefferson, Ohio.

The members and guests were divided into groups and taken on an extended tour of Battelle's Nuclear Research Center.

Halvor Christianson
Secretary

COLUMBUS

Brotzman Talks on Hand Plating

The regular monthly meeting of the Columbus Branch was held at Battelle Memorial Institute on Friday, March 6.

The business meeting was called to order by President **Harry Moore.**

Two men were duly approved and elected as members.

Librarian **Les McGraw** introduced the speaker of the evening, **P. H. Brotzman** of Ohio Metachemical Company whose subject was "Selective Electroplating By Dalic Process." He was assisted in the demonstration by **Frank Schladen.** Mr. Brotzman gave a very interesting talk on hand plating of various metals.

Halvor Christianson

DALLAS—FORT WORTH

Dr. Wesley Speaks on Nickel Plating; Browning Reports on Atlanta Meeting

The Dallas—Fort Worth Branch welcomed AES 2nd Vice President **Dr. W. Andrew Wesley** to its February 18 meeting at the Lennox Hotel. More than 50 members and guests turned out to meet our distinguished speaker. President **Myron Browning** presided.

Tom J. Foy emphasized that the entertainment committee has been hard at work on a spring occasion.

President Browning gave a brief report of news from the Atlanta meeting. The open proposal for the 1964 National Convention was made during the meeting as was a proposal for the formation of an Aircraft Coordinating Committee. Mr. Browning reported that both his proposals received favorable comment.

In electrotyping, plating rotogravure rolls, electroforming, "Plus-4" Copper Anodes cut plating costs

Electrotypers have discovered that, in addition to eliminating the use of bags and diaphragms, they can place "Plus-4" (Phosphorized Copper) Anodes closer to the cathodes to speed up the plating cycle 30% or more with the same power input—and still obtain a smooth deposit. As an alternate, power can be reduced by one third with an equal reduction in resistance and generation of heat to obtain finished electros in the same plating time. This is an important advantage when thermoplastic plates or molds are used and tanks must run no higher than 95 F.

Makers of rotogravure rolls have found that "Plus-4" Anodes provide a much finer, smoother surface for polishing and etching, and retain the quality of the light tones in runs of over one million impressions on a single set of design cylinders.

In addition, they report significant reductions in cost. One publisher found that he produces superior rolls with less labor, and a reduction of 18 to 20% for materials required in the plating process. Another reports he gets a dividend of eight extra rolls for each tank load of "Plus-4" Anodes. And still another has found a 15% saving in over-all costs. **In electroforming** operations, "Plus-4" Anodes—by eliminating the most prevalent acid-copper plating difficulties—have made it practical to produce many new products. Their ability to provide a smooth, dense deposit relatively free from growths and blemishes made possible relatively thick shells for molds used in making rubber and plastic articles, and in intricate precision parts for electronic use. Electroformers report operating economies similar to those found in the graphic arts field.

WRITE FOR INFORMATION on how you can obtain a test quantity to supply one tank. Address: The American Brass Company, Waterbury 20, Conn. In Canada: Anaconda American Brass Ltd., New Toronto, Ontario.

58104

ANACONDA®

"PLUS-4"® ANODES Phosphorized Copper

Made by The American Brass Company

Don L. Allie proposed a motion that we enter a full Texas-size campaign to "get" the 1964 Annual Convention.

President Browning introduced our honored speaker, Dr. W. A. Wesley, Manager of INCO Research Labs, who presented one of the finest talks heard in this area. He especially touched on those phases of nickel plating most interesting to both industrial fabricators and aircraft engineers. Following a very interesting discussion sessions, Dr. Wesley was given a standing ovation.

A. C. Fricke
Secretary-Treasurer

DALLAS—FORT WORTH
Lux Speaks on Cleaning Techniques; Seeks National Convention in 1964

The January 19 meeting was held at the Lennox Hotel at Grand Prairie. Twenty-eight members and guests were present as President **Myron Browning** opened the meeting.

The first item of business was the proposed Southwestern Regional Group formation. It was decided to get more of a feel for area limits from the executive group at the Atlanta meeting before contacting neighboring branches. It was urged that we plan to contact Kansas City, Tulsa, and Houston first.

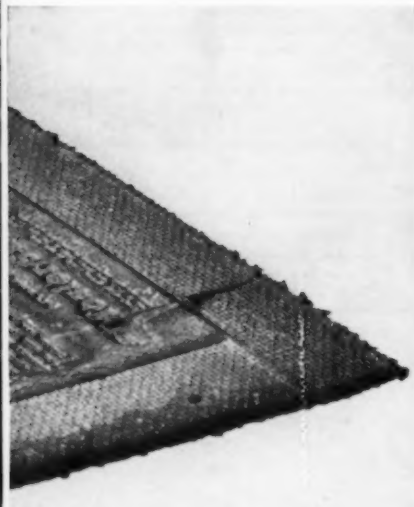
A renewed discussion was aimed at proposing the National Convention for Dallas —Ft. Worth in 1964.

Jim H. Weaver proposed that the wives be invited to a near future meeting and made aware of their part in the convention proposal through the Ladies Auxilliary.

Librarian **Ted Betz** introduced our speaker of the month, **G. A. Lux,** technical director of Oakite Products. Mr. Lux spoke on cleaning techniques for the metal finishing industry. His very unique demonstration on the importance of fundamentals in finishing was extremely well received.

A suggestion that we each make a special effort to bring a new prospective member for the next meeting was proposed by **Mr. Fricke.**

M. T. Norris
Second Vice President



DETROIT
Blount Presents Movie of Japan

Approximately 200 Branch members and wives attended Ladies' Night on Friday evening, March 6, at the Statler Hotel, Detroit.

Ezra A. Blount, editor of *Products Finishing* showed colored movies of Japan and gave a commentary. **Vincent Cassidy,** of Ford Motor Company, was technical chairman.

The meeting notice reported the election of two new members. This brings the total Branch membership up to 690.

Nominations for officers for the 1959–60 Society year were read.

The executive group did not have a meeting this month due to the fact that The Udylite Corporation had a cocktail party dinner and presentation of their new VIP machine in the main ballroom of the Statler prior to the Branch meeting.

R. C. Trees
Publicity Chairman

GRAND RAPIDS
Castle Discusses Mechanical Finishing

The regular monthly meeting of the Grand Rapids Branch was held Friday, March 13, in the Trader's Room at Scotties' Restaurant. Forty-seven members were present for the dinner.

The business meeting conducted by President **Paul Waalkes** included the nomination and election of a slate of officers for the 1959–1960 season. The officers elected were: President, **Donald R. Smith;** first vice president, **Thomas C. Henner;** second vice president, **Orville D. Hoxie;** secretary, **Carl J. Byrns Jr.;** treasurer, **Bernard Kumko;** librarian, **William Griffin;** assistant librarian, **William McGee;** Board of Managers, **John Dykstra, Donald H. Schantz** and Paul A. Waalkes.

Three new members were elected.

The Grand Rapids Branch unanimously voted to bring a proposal before the National Convention in June to increase the per capita dues from the present $5.70 to $10.00 a year. The justification for this increase was presented by National Third Vice President **Chester Borlet.**

The speaker for the evening was **C. Heamon Castle,** executive vice president and technical director, Abrado Finish Corp. Mr. Castle discussed mechanical finishing, particularly as related to barrel burnishing. Along with Mr. Castle's most

IF IT'S COLOR YOU WANT

use

Luster-on®

Chromates on Zinc

Now . . . at a low, low cost . . . you can get brilliantly bright and sparkling colors from an improved Luster-On Chromate dip process for your zinc-plated small parts.

And . . . even more important . . . these are not just dull identification colors. They are glamorous and sales-building golds, yellows, blues, reds, greens, violets, brass and copper hues.

Write today for the full story on revolutionary LUSTER-ON COLOR. Sample gladly processed free.

Use **STRIPODE**

the proved addition agent

- to strip nickel plate faster.
- to protect the base metal from pitting, roughening and etching.
- to save on use of acid.
- to eliminate need of sand blasting or heavy buffing.

Order a trial gallon

The Chemical Corporation

57 Waltham Ave. • Springfield 9, Mass.

West Coast: Crown Chem. & Engr., Los Angeles & San Francisco
Canadian Licensee: Alloycraft Ltd., Montreal

interesting talk, many slides were shown, pointing out applications and results of burnishing with various abrasives on a variety of base metals. A complete description of vertical fixture machines using wet abrasives was given.

Thomas C. Henner
First Vice President

HARTFORD
Brenner Tells of Recent NBS Research

The Regular Branch meeting was held at the Hotel Bond March 16 and 73 members and guests were present. Preceding the meeting a movie in color, entitled "What Makes Us Tick", was shown.

The guest speaker for the evening was **Dr. Abner Brenner** from the National Bureau of Standards, whose subject was "Recent Researches in Electrodeposition at the National Bureau of Standards".

Electroforming of nickel for printing plates was described by Dr. Brenner with additives used in the baths to obtain the required properties. The plating of aluminum over nickel from a molten cryolite bath was described and fusion of this coating resulting in an alloy that approaches chromium in hardness. This hardness is retained even at higher temperatures where chromium begins to soften; also this coating has good oxidation stability. The plating of tungsten from fused baths and gas plating of tungsten over carbon from the hexacarbonyls was mentioned. The plating of a radioactive silver in missile study was briefly mentioned and various slides were shown describing the apparatus used.

The technical chairman for the evening was **Arthur Logozzo.**

Stanley Platoz
Secretary

INDIANAPOLIS
Waste Treatment Discussed by Hesler

Thirty-five members and guests of the Indianapolis Branch met on March 2, 1959, at Fox's Steakhouse for the monthly meeting. Paul Johnson introduced the speaker, **J. C. Hesler** of the Industrial Filter and Pump Manufacturing Co. of Chicago. Mr. Hesler discussed the various plating room wastes and the destruction of such wastes by chemical means. He stressed that by proper design of rinse cycles and equipment, the volume of wastes for treatment can be reduced.

Following the talk, **John Hood,** Branch president, opened the business meeting. Three applications for membership were received. They were accepted by acclamation on a motion by **Bob Stewart** and a second by **Harry Smith.**

Les Reynolds reported on a certificate of membership which is to be awarded by the Branch to members who have maintained their memberships for periods of 10, 15, 20 years and longer. He asked a committee be named to establish the men eligi-

Save More IMMEDIATE SHIPMENT!

Select from one of the nation's largest stocks of guaranteed rebuilt electroplating motor generator sets and rectifiers with full control equipment.

MOTOR-GENERATOR SETS
All Sizes Up to 8000 Amps.
Popular Makes • Chandeysson • H-VW-M • Elec. Products and Others

SPECIAL M-G SET OFFERING
Rebuilt **HVWM** 3000/1500 amp., 12/24 V., synch., exc.-in-head; 440/3/60 AC. Excellent for anodizing 1500 A., 24 V. **SPECIAL PRICE F.O.B. CAMB. $3500.00**

ANODIZERS
Various Makes Up to 1500 Amperes

SPECIAL ANODIZER OFFERING
1—**IDEAL ANODIZER,** 1000 amps., 30 V., exc.-in-head, full controls, 220/3/60 AC. **PRICE: F.O.B. CAMB. $1850.00**

RECTIFIERS
All Makes Up to 8000 Amperes

SPECIAL RECTIFIER OFFERING
25—**G.E. & H-VW-M** 500 amp., 6 v. or 250 amp. 12 v. basic rectifiers. **SPECIAL PRICE: F.O.B. CAMB. $250.00 EACH**

MISCELLANEOUS

3—LA SALCO Ball Burnishing Barrels. Sizes 1, 2 & 4.

1—L'HOMMEDIEU 5 H.P. Variable Speed. Buffer. Model 18.

2—RANSOHOFF & COLT Gas-heated Hot-air Spiral Dryers.

1—ESBEC Horizontal Tumbler 32"x48", 2 comp., Neoprene Lined, 5 H.P. 220/440/3/60 variable speed.

4—No. 2H BAIRD Poliaction Tumblers.

2—Model B NIEHAUS S.S. Fume Exhausters.

3—Industrial Type RDR-1 Rubber Lined Filters 14 x 36; 14 x 28; 10 x 28.

1—No. 2 LA SALCO 15x30 Motorized S.S. Cleaning Cylinder, 3/16" perf.

2—HVWM 14x30 Cyanide Plating bbls.

1—200 gal. BARNSTEAD Demineralizer Model FM-3 with 500 gal. storage tank.

2—CROWN & H-VW-M Centrifugal Driers No. 1 and No. 2 with Heat.

2—NOBLES Centr. Dryers, 1 Steam, 1 Elec. Heat.

1—No. 2 MERCIL Centr. Dryer, steam Heat.

Exhaust Blowers in all sizes.

Other outstanding values in stock. You'll save more if you check M. E. Baker first for all your Plating, anodizing and metal finishing needs.

M. E. BAKER CO.
Klrkland 7-5460
25 Wheeler St., Cambridge 38, Mass.

Left to right, Louisville Branch President Stanley Beyer introduces National President Herberth E. Head at the Tri-State Regional Educational Session. Mr. Head chairmanned the session. Dr. Henry Brown, Udylite Corp.; Eugene L. Combs, Diamond Alkali Co.; and James H. Peacock, Duriron Co. presenting the technical papers.

ble for certificates so that these awards may be made at the Ladies Night meeting in May. John Hood appointed **Ed. Bruck, Al Kriese,** and **Quentin Shockley** to form the committee.

Addison Howard, Branch Delegate to the Interim Meeting in Atlanta, reported on the meeting and some of the proposed amendments to the Constitution which will be voted upon in Detroit.

A. M. Howard
Secretary

LOS ANGELES

Hydrogen Embrittlement Presented by Carlisle

The January meeting was opened by President **Norm McEwan. Bill Heineke** introduced twelve visitors.

George Hetz introduced six prospective members. Three men were inducted into membership.

George Hetz asked for everyone's support for the 1960 Convention.

Harvey Hunt introduced **Matthew Carlisle** of Northrop Aircraft. Mr. Carlisle is chairman of ARTC Project W-95 on Hydrogen Embrittlement. Mr. Carlisle told of methods of testing hydrogen embrittlement. A long question and answer period followed the very interesting talk.

Don Baudrand
Secretary

LOS ANGELES

Johnson Gives Illustrated Filtration Presentation

The February meeting was called to order by President **Norm McEwan.**

Larry Henderson reported on the March 21, Party: The ice show will be on Golden Ice. The noon speaker will be Les Richter of the Los Angeles Rams football team. He will show movies of some Ram Highlights.

Harvey Hunt reported on the Educational session: The speakers will be **Dr. Beckwith** of Harshaw Chem. Co., **Dr. Sam Spring** of Kelite, and **Dr. Goldwasser** of Packard Bell.

George Hetz co-chairman of the 1960 Convention stated that the Convention may be postponed two weeks because of interference from the Democratic National Convention.

Ken Johnson of Industrial Filter presented an informative talk on filtration. He showed a movie of the latest developments in filter design. Mr. Johnson also showed slides of a large installation illustrating the use of filter equipment.

Don Baudrand
Secretary

LOS ANGELES

Hetz Heads New Slate of Officers

The March meeting was opened by President **Norm McEwan. Bill Heineke** introduced four guests; one of them was **Francis T. Eddy;** National Past President.

President McEwan installed two new members.

Larry Henderson reported that approximately 550 tickets had been sold to date for the dinner-dance. Two autographed footballs by the Los Angeles Rams will be given away at the luncheon.

George Hetz announced that the 1960 Convention will be held two weeks later than previously announced.

Don Bedwell, Honorary member, was present. He plans a trip to Europe in the near future.

The following were elected to office: George Hetz, president; **Frank Virgil,** 1st vice president; **Emmett Babcock,** 2nd vice president; **Harvey Hunt,** secretary; **Don Baudrand,** treasurer; **Marge Farmer,** librarian; Norm McEwan, **Norm Painter, Claude Weekly,** board of managers.

A movie "This is Aluminum" was shown.

Don Baudrand
Secretary

LOUISVILLE

Walther Speaks on Barrel Roto-Finishing

The regular meeting of the Louisville Branch was held on February 19, at Hasenour's Restaurant.

Ken Reifsteck reported on the progress of plans for the annual Tri-State Meeting and announced that a Ladies Program has been added to the agenda.

Stan Beyer informed us that application has been made for our AES Branch to become affiliated with the Louisville Engineering and Scientific Societies Council.

The Louisville Metal Treating Company was "it" for the Industry Nite, and their president, **Charles Peters,** presented a talk accompanied by a short film depicting all his shop operations.

William Walther of the Roto Finishing Company was introduced by our Librarian, **James Smith.** Mr. Walther gave an interesting slide presentation of the latest barrel finishing techniques and equipment design. His discourse was complete with samples of parts in various stages of finishing.

After the lecture, refreshments were furnished by the Louisville Metal Treating Co.

L. W. Dawson
Recording Secretary

LOUISVILLE

Tri-State Meeting Plans Finalized; Squitero Speaks on Nickel Plating

The regular meeting of the Louisville Branch was held on March 19, at Hasenour's Restaurant with 24 members and 4 guests present.

Ken Reifsteck, chairman of the nominating committee, presented two slates of candidates for our perusal prior to the coming election. This Committee will also propose a "Man of the Year" for our Branch, eg., one who has done the most for our group.

Ken Buse described the various metal finishing operations in the plating department of the General Electric major appliance, dishwasher and disposal department.

After adjournment; **A. D. Squitero,** chief chemist of the Hanson-Van Winkle-Munning Co. gave an interesting slide presentation of the functional and engineering aspects of six different types of nickel deposits, including their physical properties and the various types of addition agents employed.

The meeting was terminated after a short question and answer period and refreshments were served by H-V.W.-M.

L. W. Dawson
Recording Secretary

MELBOURNE
Plan Quality Control Conference

The 14th Annual Meeting of the Melbourne Branch was held at the Royal Melbourne Technical College on Feb. 19.

The president, **John Christian,** opened the meeting and presented a report on the previous year's activities. The annual elections resulted in the following:**Lionel Esmore,** president; **Hugh Teague,** 1st vice president; **Bruce Leslie,** 2nd vice president; **Ian Rose,** secretary; **Ken Staggard,** treasurer; **George Allen,** librarian; **Clem Hill, Kevin Howard** and **Bill Regan,** Board of Managers.

After a general discussion on the Branch's activities, the president introduced **Herbert Littauer** of Half Moon Products, who delivered a most interesting report on the 1958 AES Convention, and also his Impressions on Anodizing Practice in the USA. Mr. Littauer's comments were warmly appreciated.

The incoming president, Lionel Esmore, in accepting the office thanked John Christian for his efforts in 1958 and promised members a most active year ahead including a special conference on "Quality Control of Electroplating" to be held on May 21.

Ian Rose
Secretary

MILWAUKEE
Lowenheim Talks on Corrosion

The 497th regular meeting of the Milwaukee Branch was held March 20 with President **Frank Marshall** presiding.

This being a dinner meeting honoring the Sustaining Members of the Branch, all regular business was dispensed with.

Art Linn introduced the Sustaining Members. After a short resume on the functions of AES Research and the importance of the continued support of these members, he introduced the speaker of the evening, **Dr. Frederick Lowenheim,** who presented a paper on "Corrosion". He spoke on the effects of corrosion on copper, nickel chrome plates and also showed, by the means of colored slides, these corrosive effects in different parts of the country.

Frederick F. Padgett
Secretary-Treasurer

MOHAWK VALLEY
Combs Presents Chrome Plating

The Feb. 12 meeting at Thompson's Hotel, Yorkville, N. Y. was opened by President **C. A. Bridgett.** There were 40 in attendance. The "Beaker Fund" was won by **Merle Ihrie.**

George E. Simmons introduced the speaker for the evening, **Eugene L. Combs** of Diamond Alkali Co.

The topic was "Chrome Plating Up to Date." Some of the highlights were: That the ores from which chromic acid are manufactured are imported from overseas and a year's supply is kept on hand. There are two major basic suppliers in the United States. Seventy per cent of the raw material is used for plating. He pointed out the varied properties of the plate that is now required in specifications and the need for tailor made baths. He predicted that through research a bath will be developed with 30–70 per cent efficiency in low current density areas. Also that a much heavier plate is now the trend to accomplish better corrosion protection.

Henry J. Crouse
Secretary

MOHAWK VALLEY
Brumbaugh Speaks on Surface Preparation

The meeting was opened by President **C. A. Bridgett** later than announced originally because of the conditions of the roads.

Due to the heavy drifting snow, several of our faithful members were unable to attend. Attendance dropped to twenty.

Mr. Bridgett called attention to the 5th Annual Empire State Regional Meeting to take place April 11, at Buffalo N. Y. Our Branch has appointed Bridgett and **Robert Stewart** as delegates, with **Jack Bension** and **Frank Czech** as alternates.

R. Stewart announced that the Dinner and Dance will be held May 2 at Twin Ponds Golf & Country Club.

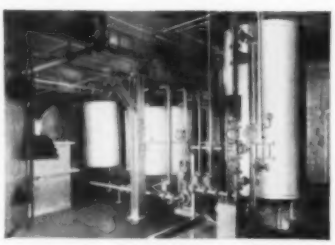
First Vice President **Jack Bension** introduced the speaker for the evening **George Brumbaugh** of Amchem Products Co. His topic was "General Practices of Metal Surface Prepaint Preparation."

ionXchange

DO YOU WANT TO SAVE MONEY?

Here is how to solve some waste disposal problems -and reduce costs at the same time

IonXchangers of several types, and various units of allied equipment, as designed and manufactured by Illinois Water Treatment Company, offer a number of money-saving opportunities. *For example, consider the waste water from rinse tanks.* Contaminants can be removed and concentrated, and *pure* water returned to the rinse system. In some instances, chrome and other valuable metals can be recovered from the rinse water. *For another example, consider plating solutions* which, under many circumstances, become polluted and less efficient. The contaminating materials can be removed, recovered if valuable, and the bath maintained at high purity. Also, impurities found in water supplies, to spoil the appearance of plated or anodized parts, can be removed so that uniform quality of work is assured. Spent metal finishing solutions such as aluminum bright dip can be purified for re-use. Toxicity in otherwise-clean waste can be eliminated. All of these treatments will, in one way or another, contribute substantially to improved products, more efficient operations, and lowered costs. *Specific possibilities of applications of ionXchange in your plant can be determined by talking to your ILLCO-WAY representative.*



IonXchanger recovery unit for plating solutions

ILLINOIS WATER TREATMENT CO.
840 CEDAR ST.,
ROCKFORD, ILLINOIS

NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.

ILLCO-WAY

Panels with various coatings were passed around and the speaker described the use and value of each coating. Metals treated were steel, aluminum and zinc.

In addition to the removal of all deleterious matter these coatings serve as mechanical anchors, also the coating is inert and protects the metal if a scratch or break in the paint surface should occur.

He stressed the importance of clean and thorough rinses if full advantage of the coatings are to be realized.

Henry J. Crouse
Secretary

NEWARK
Borlet Installs Officers; La Que Talks on Outer Space Metals

Some 65 members and guests celebrated the advent of spring (shunning nature's call—warm zephyrs, birds warbling, frogs calling, etc.) by attending the second annual Sustaining Members' meeting on March 20.

No "communications and bills" (normal order of business) were presented, but a disturbance at the rear of the room proved to be three old-timers (Ehrhardt, Oldam and Foulke) complete with derbies or caps and one with a handle-bar mustache, representing *alter ego* 1913, who proceeded to read the Branch History just completed.

Chet Borlet, national third vice president and **Joe Rembecki,** vice president of New York Branch were introduced as were Sustaining Member representatives.

Two membership applications and five new members were accepted.

President **Bittrich** presented his annual report for the Branch citing as accomplishments the adoption of a set of Bylaws, the establishment of the Louis Donroe award, obtaining the convention for 1963 and writing of the Branch History.

Officers elected for the ensuing year were: **Fred Meyer,** president; **John Banta,** 1st vice president; **Howard Martin,** 2nd vice president; **George Wagner,** treasurer; **Don Foulke,** secretary; **Al Korbelak,** librarian; **Cy La Manna,** sergeant-at-arms; **Thomas Austin, Gustave Bittrich, William Grigat, George Reuter, Clifford Struyk,** Board of Managers; **Don Foulke, George Wagner, W. A. Wesley,** Delegates; **William Grigat, Al Korbelak, Cy La Manna,** Alternate Delegates.

Chet Borlet proceeded to install the officers and Board of Managers and Fred Meyer presented Gus Bittrich with his Past President's pin.

Librarian *pro tem* Cy La Manna introduced Chet Borlet of Grand Rapids Brass Co. as the first speaker of the evening. Chet discussed the "Engineering Aspects of a Good Filtration System" Types of filters, piping arrangement, filter location and solution discharge were touched upon and it was emphasized that filter installations must be properly engineered

Frank La Que, vice president and manager of development and research, International Nickel Co., then spoke on "Metals for Outer Space". He explained the heating effects, discussed missile construction and metals in use and materials of potential value. He pointed out that the greatest problem was re-entry into the earth's atmosphere and that solution of the missile problems would probably solve at least the material problems associated with space travel.

D. Gardner Foulke
Secretary

NEW HAVEN
Bertucio Speaks on Anodizing

The New Haven Branch held its regular meeting on Tuesday, Jan. 13 at the New Haven Motor Inn. President **Charles A. Kuster** opened the meeting. The Sick Committee reported the serious illness of a fellow officer **Ed. Jorczyk.**

(LEFT) National Third Vice President Chester G. Borlet installing the new officers of Newark Branch, (RIGHT) Frank La Que delivering paper at Newark March meeting.

Technical Chairman **Austin P. Jackson** introduced **Edward C. Bertucio,** service representative, Solvay Process Division, Syracuse, who spoke on "Chromic Acid Anodizing". Mr. Bertucio gave an informative talk on the anodizing characteristics

Once you use it you'll Order... Again... and Again... and Again!

Every can filled with a full weight of extra high quality 99.75+% Chromic Acid. Prompt delivery made from ample factory and nearby distributor stocks.

BETTER FINISHES & COATINGS, INC.
268 Doremus Avenue, Newark 5, N. J. · 2014 East 15th St., Los Angeles 21, Calif.

of common aluminum alloys in chromic acid solutions. Theory of the development of the anodic coating was briefly described. Operating variables and their effect on the properties of the coating in relation to accelerated and service testing was discussed.

B. J. Gaffney
Secretary

NEW HAVEN
Strow Discusses Barrel Plating

The New Haven Branch held its regular monthly meeting on Tuesday, Feb. 10, in the New Haven Motor Inn.

President **Charles A. Kuster** held a short business meeting and then turned the meeting over to Technical Chairman **George F. O'Connor** who introduced **Henry Strow,** president, True Brite Chemical Products, Co., Oakville, Conn. who spoke on "Alloy Barrel Plating". Mr. Strow's discussion covered various alloy plating in barrel lines for production runs. The current bright brass plating and finishing, and spotting out.

B. J. Gaffney
Secretary

NEW HAVEN
Lux Speaks at Ladies Night

On Tuesday, March 10, the New Haven Branch held its Annual Ladies' Night at Les Shaw's Rib Room just off the Merritt Parkway in New Haven, Connecticut. The ladies were given a choice of chicken or lobster dinner and while the members paid their own way, the Branch picked up the "tab" for the ladies. President **Charles Kuster,** presided and called for a report on the Interim Meeting from **Dr. Henry Kellner.** The technical chairman, **Edward Foley,** introduced the speaker **G. A. Lux** of Oakite Products, who gave a very interesting talk on "Household Detergents". Following the meeting the ladies who held lucky coatcheck numbers received many door prizes.

B. J. Gaffney
Secretary

PHILADELPHIA
Blount Discusses Metal Surface Preparation; Ladies Night Date Fixed

The regular meeting was held at the Engineers' Club on March 23 with 35 at dinner and about 50 at the meeting. Two active members were admitted and one application was received. Branch president **Farren** announced the Nominations Committee: **Jack Ross,** chairman; **Joseph Gellenthin** and **Eugene Zurbach.** Nominations will be presented at the April meeting—elections will be at the May meeting.

By a motion, June 19 was fixed as the date for Ladies Night, to be at the Sandy Run Country Club.

The secretary read the letter from Arthur Pierdon of the Baltimore-Washington Branch, dated March 19, sent to the Delegates regarding the proposed action to increase per capita tax to $10.00. Considerable discussion followed which resulted in a motion that the Philadelphia Branch Delegates would be sent to the Detroit Convention uninstructed regarding the matter of a per capita tax increase.

The speaker was **Ezra A. Blount,** editor of *Products Finishing* whose subject was "Preparation of Metal Surfaces for Organic Finishing." He summarized the various methods used to prepare for painting aluminum, steel, chromium plating, zinc die castings, plating and galvanizing and magnesium.

I. Wm. Marcovitch
Secretary

PITTSBURGH
Branch Marks 40th Anniversary; Mitchell on Conversion Coatings

The March meeting marked the Branch's Fortieth Anniversary. Past Presidents attending from near and far were: **M. Ceresa,** '56–'57; **R. Varner,** '54–'55; **E. Smith,** '50–'51; **J. Coros,** '48–'49; and **W. Hennessy,** '47–'48.

There were two elections to membership.

The Branch held its election of officers, resulting as follows: **W. F. Pizoli,** president; **R. E. Woehrle,** first vice president; **C. A. Forbes,** second vice president; **E. B. Keller,** secretary; **E. L. Kost,** treasurer; **F. Stevens,** librarian; M. Ceresa, **J. Crain,** and E. Smith, Board of Managers; **R. Burford, D. Smith,** and **F. Carpenter,** Delegates; M. Ceresa, C. Forbes, and W. Pizoli, Alternates.

Librarian C. Forbes introduced the speaker, **Harold L. Mitchell** of the Chemical Corporation. Topic: "Chromate Conversion Coatings and Color Dichromating."

E. Keller
Secretary

SAGINAW VALLEY
Instrumentation Discussed by Casey; New Officers

Fifty-three members and guests of the Saginaw Valley Branch met at Zehnder's Hotel, Frankenmuth, on March 11. After prying the gathering away from the Bock Beer, President **Stew Harger** was able to get the dinner underway.

Charles L. Southwick, chairman of the Transportation Committee of the GOLDEN JUBILEE Convention, gave a short talk about the Convention. **George McCloud,** Du Bois Co., donated this months door prize. **Joe Manzella,** R. O. Hull Co., was the lucky winner of the field glasses.

F. J. Reha, Udylite Corp., urged all members to send in their questions for next months Past Presidents Forum. This is to be known as "*The Council of the*

MANUAL AVAILABLE TO BRANCHES

As a reference source to help Branches and Branch officers in effective Branch operation, many dedicated National and Branch leaders collaborated, without any remuneration, in preparing the comprehensive BRANCH OFFICERS MANUAL of the American Electroplaters' Society, embodying practically every conceivable Branch operating subject from membership promotion to Delegates' duties.

Within red covers bound by Chicago screws, this 225-page consolidated mimeographed looseleaf book is now in use in 36 AES Branches that ordered copies.

A limited extra quantity of the book is still available at National Headquarters for the accommodation of Branches that have not previously ordered copies. These will be sold to Branches (only), on a first-come, first-served basis so long as that supply lasts, at $5.50 per copy, including postage to one destination.

Write American Electroplaters' Society, Inc., American Building, 445 Broad Street, Newark 2, N. J. Payment should accompany order to obviate unnecessary bookkeeping expense.

You Askum—We Knowum Tribe." The meeting is to be held in Zehnder's Longhouse on the banks of the Mighty Cass River. Prizes are to be given for the best questions.

H. F. Hooker, announced the winners of the election. New officers for the coming year are: **D. William Snyder,** president; **Raymond E. Gittens,** first vice president; **Frank J. Reha,** second vice president; **George E. Savage,** secretary and treasurer; **Harrison F. Hooker,** recording secretary; **Patrick H. Kehoe Jr.,** librarian.

Librarian **Art Medwedeff** introduced the speaker **Charles M. Casey,** sales engineer, Beckman Instruments, Inc. His topic was "Instrumentation in the Electroplating Industry." The meat of the subject was what is meant by *p*H and how it is measured.

Entertainment chairman **Jim Reed** closed the meeting with a movie on fishing in South America.

George E. Savage
Recording Secretary

ST. JOSEPH VALLEY
Wesley Presents Paper

President **Ray Dearth** opened the December, 1958 meeting and asked for a round robin of introductions. One applicant was elected to active membership.

Gene Roth, chairman of the bylaws committee, read the new bylaws. Mr. Roth thanked his committee of **Lou Ragne** and **Dick Aiken** and also acknowledged the assistance given him by President Dearth and National First Vice President **"Duke" Wysong.**

Mr. Roth, our representative to the Midwest Regional organization, read the objectives and future activities of the newly formed organization.

Librarian, **Jack Petersen** introduced the speaker of the evening, **Dr. W. A. Wesley,** manager of International Nickel Company's research laboratory, who spoke on the "Weathering Behavior of Nickel-Chromium Coatings."

Dr. Wesley explained the two schools of thought concerning porosity and its causes: First, that all coatings are porous as deposited in good quality plating, and secondly, that there are no pores in good quality plating of 1 mil thickness but that pores have their origin in corrosion beginning from the outside. The weakness in No. 2 is the question of why the coating should fail in such few spots rather than in millions. It is apparent that the real answer lies between the two.

The metal lattice is not as perfect as once postulated, all have structural defects. Imperfections in metals are classified as:

Atomic	Line
Lattice Vacancies	Edge dislocations
Interstitial atoms	Screw dislocations
Impurities	

Surface

Gain boundaries Mosaic boundaries
Twin boundaries Free surfaces

Here, Dr. Wesley showed excellent slides clarifying the effects of imperfect metal atoms, edge dislocations, grain boundary defects and other causes of defects.

The idea that dislocations are the cause of pitting has not been brought forth previously because of the enormously large number of dislocations, but later work shows the possibility of dislocations coalescing when exposed to high stress. When the high stresses are pinned or prevented from moving to the surface, a crack or fault results.

Another possibility of pore formation is the formation of a pipe, or hole in the center of a crystal, originating from a single dislocation group emerging on the crystal surface. Impurities as a few ppm of hydrogen can result in this type of strain.

Pores are possibly blind holes that do not go thru the deposit, but a certain few large ones may allow pitting to begin. Purity smoothness of a nickel undercoat are of extreme importance in pitting possibility.

The behavior of plated chromium on different basis metals is as wide variance with respect to resulting degree of porosity. Stresses in the chromium deposit also contribute a great deal of difference in the degree of pitting—the less stress in the heavy chromium, the less susceptibility to pitting corrosion.

Composite coatings of Cr, Co and Sn and others between two layers of nickel have very markedly improved pitting corrosion resistance.

Henry A. Meers
Secretary

ST. JOSEPH VALLEY
Plating Wastes Discussed by Day

The meeting was opened by President **Ray Dearth.**

Gene Roth, delegate to the Midwest Regional Council and chairman of the bylaws committee distributed copies of the new and revised bylaws. This constitutes the second reading which will be voted on and finalized at the next meeting.

Librarian **Jack Petersen** introduced the speaker of the evening, **Robert V. Day** of Clyde E. Williams and Associates. His subject was "Disposal of Plating Room Wastes."

Plating wastes constitute floor washings, rinse waters, rinse tanks, plating solutions and any other toxic compounds originating in the plating room. These compounds are highly toxic to all forms of life and therefore must be treated with much cau-

STUTZ BALL ANODE CONTAINER

New Construction for longer Service . . .

STUTZ CONSTRUCTION

Heavy gauge steel with wire woven through steel angle firmly attached to main stem. Cannot come apart or loosen. Side clip is for STUTZ BARREL PLATING TANKS having submerged rectangular anode bars. Side clip not furnished for racked plating tanks. Standard hook 6 inches. Other hook lengths furnished in quantity of 100 or more.

WELDED CONSTRUCTION — Note how welds have dissolved or broken in use. Often caused in barrel plating where currents are high and barrel transfer is rapid.

Write for Complete Literature

PRICES—12 cents per inch for basket lengths 18 inches or longer. Side clip 15c extra. Increments 3 inches. Curved containers one size only, 27" for 14" and 16" diameter barrels 15c per basket additional.

The STUTZ Company *Complete Metal Finishing Equipment & Supplies*
4420 Carroll Ave. • Chicago 24, Ill.

tion. Streams may also be polluted by non-toxic substances forming a fibrous seal on the bottom of the stream.

One gallon of concentrated plating solution must be diluted with 122,000 gallons of water for it to be non-toxic to fish.

Wastes could also be dumped into sewers untreated, but here the danger of clogging exists, or materials that may affect sewage disposal processes or expose disposal plant workers to dangerous conditions exists. This disposal means, of course, requires discretion and judgment. Cyanides in small quantities are readily oxidized, but sudden large amounts immediately kill the bacteria. Heavy metals Ni, Cu, Cr3, Cd and Cr6 are all toxic and must be handled with great care.

Ion exchange methods have progressed a great deal and accomplish recovery of chromium to a high degree and work is now being directed toward recovery of cyanide wastes. The one drawback to this method of waste disposal is its high initial cost, but a tangible return is realized.

Lagooning is a simple method of disposal but should not be followed because of the inherent danger of seepage and subsequent poisoning of wells. Destruction of contaminants entails alkaline chlorination of cyanides. Oxidation of Cn by Cl occurs in two steps. First, is conversion to cyanate and is *p*H dependent. This reaction must be allowed to go to completion to insure total conversion of the highly toxic cyanogen chloride to cyanate. The cyanate is then converted to bicarbonates and nitrogen, the second reaction is again *p*H controlled. 6.8 parts of Cl are required for each part of cyanide, caustic requirements are just enough to neutralize the chlorine. Cuprous Cu-requires 0.56

Ni	2.25 parts of Cl
Fe +3	.64 parts of Cl
Ammonia	7.5 parts of Cl to be oxidized to be low for presence of hypochlorous acid.

Ni in Cn waste should be avoided because Ni $(CN)_2$ is very stable and is almost impossible to oxidize by chlorination.

Mr. Day showed slides illustrating possible plant layouts for the chlorination process.

Hex Cr +6 is reduced to trivalent Cr through the use of SO_2. to yield chromic sulfate or sulfite depending on the source of SO_2. This reaction also *p*H sensitive, the nearer neutrality the slower and less complete the conversion. H_2SO_4 is also required. The more concentrated the Cr wastes the less SO2 excess is required. The trivalent Cr is then removed by potation as chromic hydroxide Reduction of hexavalent chrome with ferrous iron is not as good a procedure because of resultant large amounts of sludge. Small plating establishments may treat their wastes best by chlorination or sulfonation in the rinse tank directly. The waste is not cyanide-free but is much lower and may well be within limits.

H. A. Meers
Secretary

ST. JOSEPH VALLEY

Rectifiers Described by Day

The meeting was opened by President **Ray Dearth** who called for a vote by the membership to accept the revised bylaws as written.

A new educational committee, composed of **Kenneth Harlan** and **John Bayman**, with **Dr. Ernest Wilhelm** as chairman, was appointed.

A brief report on Ladies Night preparations was made by **Lou Rague.** Librarian **Jack Petersen** introduced the speaker of the evening, **J. F. Day,** electrical engineer with the Udylite Corp.

Mr. Day began by giving a short description of rheostats, shunts, meters and the types of semi-conduction. He then

For Metal Finishers!

Pressure Moulded "CAPLUGS" NEOPRENE

7 STANDARD SIZES

	A	B	C	D	E	F	G
TO PLUG HOLE SIZE	1/8-3/16	3/16-1/4	1/4-5/16	5/16-1/2	1/2-5/8	9/16-11/16	5/8-3/4
TO CAP STUD SIZE	3/32-5/32	5/32-3/16	3/16-1/4	1/4-5/16	5/16-3/8	3/8-7/16	5/16-1/2

MASKING PROBLEMS OUR SPECIALTY!

WRITE FOR FREE SAMPLE KIT.

7075 LYNDON AVENUE
DETROIT 38, MICHIGAN

DUGGAN Masking Devices

Looking for a Better Finish?
Switch to
HARRISON'S

4A

Tailor-Made
CAKE AND LIQUID
BUFFING & POLISHING COMPOUNDS
for
Aluminum, Brass, Copper, Stainless Steel,
Carbon Steel, Plastic, Wood, etc.

EMERY CAKE, GREASE STICK, TRIPOLI
POLISHING CEMENT AND THINNER
for setting up wheels, belts and rolls

HARRISON & COMPANY, INC.
P. O. BOX 457
HAVERHILL, MASSACHUSETTS

explained the magnesium-copper sulfide rectifier and step-wise methods of locating trouble points.

After discussing copper-oxide rectifiers and their advantages and disadvantages, he showed again the trouble shooting methods.

Selenium rectifiers are both of high efficiency and light weight. Voltage drop again increases a great deal as the plates age. In trouble shooting, the first check (if large voltage drop) will be a primary problem as a broken lead, fuse or poor connection. If voltage drops gradually, the stacks are aging and taps will have changed. At the appearance of melted solder at the bottom of the stacks, they are useless.

If voltage and current drop simultaneously, the trouble is internal. If current drops and voltage raises, the trouble is external. In recent years, improvements have been made in selenium rectifiers in that the grains have been oriented so that they are in one direction only: the current capacity has been doubled in each cell. The efficiency runs between 70 and 85 per cent depending on voltage. The power factor, depending on type of controls, runs between 60 and 90 per cent.

The latest advancement is the silicon diode. The cell is incased in copper, evacuated and resealed. Checking of these units is very difficult and must be done in the field by use of an ohmeter. The use of these cells in a rectifier has the advantage that only one need be replaced, rather than all if faulty or shorted out. They require no matching. The cell is about 97 per cent efficient. The operating temperature of the cell is about 100C externally. The voltage output is much greater than that of germanium. These cells are checked easily and readily in the field.

The silicon is grown as a single crystal and purified in a zoning furnace. The crystal is cut in slices of 10 thousands thick. Aging effects need not be considered because there is but a single crystal rather than a multicrystal cell.

Henry A. Meers
Secretary

ST. LOUIS
Washburn Talks on Stripping

The regular monthly meeting of the St. Louis Branch was held at the York Hotel March 11. There were 20 for dinner and 29 members and guests present when president **William George** called the business meeting to order.

Three new members were accepted on a motion by **Louis Berra** and a second by **Craig McAlister.** Our annual spring banquet will be held May 2. Our chairman appointed the following nominating committee: Craig McAlister, chairman; **Dale Bolyard** and **Andy Julius.**

G. Kenneth Robins reported **Eugene Weil** died Feb. 25, while he was vacationing in Florida. He had been an active member of the Branch in earlier years and served as an officer. He had been accepted as a member again just the month before. His passing will be a great loss to our Branch.

At this point the meeting was turned over to Librarian **A. P. Wrisberg** who introduced the speaker of the evening, **Edward B. Washburn,** technical service supervisor of Enthone, Inc. His talk was entitled, "Stripping of Electrodeposits."

His talk was accompanied by slides. He discussed the strippers as electrolytic or immersion, and further divided them into the acid and alkaline strippers.

Ward Kelly
Secretary

SAN FRANCISCO
Betz Discusses Hull Cell

The March 12 meeting for the San Francisco Branch was called to order by our President **Jack Hite.**

CLOTH BUFFS
ZIPPO
• High Count, Heavy Duty, Bias-cut Cloth.
• Extra folds provide wider buff face and greater compound holding capacity.
• Ventilated Steel Centers.
• Perfectly balanced sections require no raking.
FORMAX BUFFS—These famous fast cutting and long wearing buffs continue to set the standard of performance for bias-type cloth buffs. You can depend on uniform quality from shipment to shipment.
Write for Descriptive Literature
FORMAX MFG. CORP.
DETROIT 7, MICHIGAN
"THE FOUR McALEERS"

HOLLOW CONE
in complete choice of spray patterns and capacities
FLAT SPRAY
CONTROLLED-FLOW*
SPRAY NOZZLES
*exact control of pattern, impact, volume and distribution for any liquid at any pressure.
FULL CONE
for better washing coating and rinsing
for complete information write for catalog no. 24
SPRAYING SYSTEMS CO.
3227 RANDOLPH STREET • BELLWOOD, ILLINOIS

Guy Condrott noted that 32 members and 14 guests were present.

Pat Pattenger introduced our guest speaker, **Ted Betz** of the R. O. Hull Company. Mr. Betz gave a highly interesting talk on Hull Cells supplemented by slides.

Guy Condrott stated that **Floyd Browning** has signed up Schlage Lock Company as our first Sustaining Membership. Five membership applications were approved.

An invitation was extended from the Los Angeles Branch to attend their annual technical session at the Beverly-Hilton Hotel in Los Angeles on March 21.

Ted Betz, representing the Dallas-Ft. Worth Branch of the AES asked for this Branch's support of his Branch's bid for selection of Dallas as the convention site for the AES Convention of 1964.

Murray Hart
Acting Secretary

SPRINGFIELD

Brass Plating
Presented by Mazzamaro

The Springfield Branch met at Blake's Restaurant on Monday evening, March 23 for the regular monthly meeting. After the steak dinner, the business meeting was called to order by President **Edward F. Koetsch.**

There was a minute of silent meditation for a former member **Edward T. Cofsky,** who was killed in an automobile accident just before Christmas.

Chairman of the nominating committee **John E. Costigan** presented the slate of officers for consideration from the members present. The following were elected: President, **Elery C. Gibson;** 1st vice president, **Alexander R. Salmond;** 2nd vice president, **Martin J. Murray;** secretary, **Henry L. Heissfeld;** treasurer, **George H. Mongeau;** and librarian, **Louis E. Dupuis.** For the Board of Managers: **Edward F. Koetsch Jr., Henry S. Cummings, Wayne B. Sandders, Joseph F. Mitchell,** and **Donald W. Gemme.** Research and finance chairman is **Arthur Zavarella.**

Four new members were elected.

Charles F. Griffin asked for a rising vote of thanks to **Melvin P. Roske,** for the excellent job of spearheading the activities committee, and fulfillment of his other duties as a member of the Branch. Springfield will lose a good member, but as Mel will be moving to Boston shortly, it will be Boston's gain. **Wayne B. Sanders** was appointed to replace Mel, as chairman of the activities committee.

The meeting was turned over to librarian **Alexander R. Salmond** who introduced the speaker for the technical session. **Patrick Mazzamaro,** chief chemist and supervisor of research and development of new products, of Tru-Brite Products Co., discussed the "Newest Developments and Controls of Brass Plating." The subject was well received as the process is a stranger to the area. Pat received a good round of applause for bringing the subject to light.

Henry L. Heissfeld
Secretary

TORONTO

Bulmer Speaks
on Industrial Diseases

The March Meeting of the Toronto Branch was held Friday the 13th, at the Royal York Hotel. **Bob Edwards** presided, 26 were present for dinner. The prize winner was not present so $15 will be in the kitty for the next draw, this will be dispensed with for April as the meeting is being held at Honeywell Controls Limited, Scarbourgh. 44 including seven guests turned out to hear **Dr. F.M.R. Bulmer** of the Ontario Department of Health, Division of Industrial Hygiene, his subject "Industrial Diseases". The Doctor has been with the Government for the past 35 years as Official Industrial Toxicologist. His talk was interesting and informative.

Ray Day, of Canadian Hanson-Van Winkle Company Ltd, is our president, **Charlie Reid, Marshall Darbyshire** and **Bill Johnston** were elected to the executive for the coming year. **John Harding** reports our sustaining membership committee, Chairman **Herb Skelton** has been in and out of the hospital and is at home recuperating.

A. W. Wilson
Librarian

TECHNICAL PROCEEDINGS AWAITING YOUR ORDER

CONTAINING each of the technical papers delivered before the AES's 45th Annual Convention held in Cincinnati, Ohio, May 19-22, 1958, together with their charts, diagrams, graphs, tables and other illustrations, and with the verbatim discussion that followed their delivery, TECHNICAL PROCEEDINGS (1958 Edition) broadly enriches technical and scientific knowledge in the field of electroplating, metal finishing and allied arts.

It also includes the stenotype report of the panel session on "Practical Plating Problems" that was a hit of that Convention.

A larger book than the 1957 edition, it also carries a front section that includes a complete chronological list of AES Conventions and Past Presidents; a day-to-day log of the 45th Annual Convention; a section on the AES Scientific Achievement Award and on the Paper Awards presented at that convention; a full listing of AES's 1958-1959 Boards and Standing and Special Committees and a complete Branch Directory up to date as at September 1, 1958.

The domestic price of the 1958 Edition of TECHNICAL PROCEEDINGS is $12 per copy including postage. To those ordering from outside of the United States' continental limits, the charge is $15 per copy including postage. All orders must be accompanied by payment in full. Address orders and make checks payable to:

AMERICAN ELECTROPLATERS' SOCIETY

445 BROAD STREET • NEWARK 2, N. J.

A limited quantity also exists of the 1956 book at $12.50 per copy domestic; $15 per copy foreign and of the 1957 book at $10 per copy domestic and $12.50 per copy foreign. All orders must be accompanied by payment in full.

AES MEMBERSHIP REPORT

ELECTIONS

Baltimore-Washington: R. W. Bauer, P. A. Krasley
British Columbia: C. Wolloschuk
Buffalo: J. P. Geary, F. Roller
Cleveland: S. Dobos
Columbus: P. J. Grote, R. G. Sheehan
Dallas-Ft. Worth: J. D. Haler
Detroit: D. P. Friedt, L. Perisic
Hamilton: R. J. Harrison, R. A. Hewitt, A. G. Kirby, H. G. McLeod
Hartford: E. J. Fargo
Indianapolis: J. Lazar, J. W. May, J. W. Stilwell
Los Angeles: M. E. Carlisle, J. A. Lochet, G. Q. Perrin, M. L. Peterson, J. R. Russett
Melbourne: K. H. Belcher, A. L. Bennett, B. R. Dixon, K. F. Dugan, G. S. Earney, M. S. Pennisi, M. D. Wilkin
Montreal: N. R. Coisman, O. Couture, J. Lastoria
Newark: G. W. Barbarow, H. D. Berger, S. J. Bifano, C. T. Bird, L. Botkin, V. Hospadaruk, M. S. Kaye, S. B. Messina, R. A. K. Steiger, J. M. Zulumian
New York: R. M. Stockslager
Philadelphia: W. A. Herbert, P. E. Startzman
Pittsburgh: W. D. Corr, P. T. Hess
Rockford: L. M. Bordner Jr.
Saginaw Valley: P. Dykstra, W. W. Kaufmann, G. A. Richards
St. Joseph Valley: N. Boomerschine
St. Louis: J. F. Brady, F. J. Dandridge, J. O. Harriman
Springfield: F. J. Crowley, L. J. Diamond, P. R. Lane, J. Preston
Toronto: H. Neame, R. K. Taniishi
Western Ontario: L. Rauscher
Wichita: M. Edmonston, G. L. Ericson, W. H. Kolins
Member-at-Large: A. Kutzelnigg, Germany; S. A. Sage, Lancashire, England; T. E. Such, Birmingham, England; R. J. Yackley, Reseda, California

REINSTATEMENTS

Cleveland: E. J. Cox
Hartford: G. Gardner, L. Kosowsky, A. Phillips
Los Angeles: F. Stabile
Melbourne: A. Chesterfield
Newark: S. G. Macy
Syracuse: W. Storme

TRANSFERS

Cleveland: E. J. Cox to Detroit, L. J. Molnar from Philadelphia
Dallas-Ft. Worth: J. E. Weaver to Phoenix
Detroit: H. I. Hansen to Milwaukee, F. M. Mansfield to Baltimore-Washington, J. M. VanderPloeg to Grand Rapids
Los Angeles: M. A. Bondra from Cleveland, L. Missel to San Francisco
Newark: P. H. Margulies from Buffalo
Philadelphia: F. E. Welch to Allentown-Reading
Springfield: W. C. Jones from Hartford
Syracuse: C. Oates to Waterbury
Western Ontario: E. G. Turner to Toronto

RESIGNATIONS

Central Michigan: M. C. Burke
Dallas-Ft. Worth: E. Nicholson
Detroit: R. P. Ganchan, L. G. Ward
Melbourne: J. V. Polglase
Pittsburgh: J. G. Lussier
Rochester: A. W. House
Toronto: S. G. Bessor

SUSPENSIONS

Central Michigan: K. Kingsley
Hartford: D. Colavecchio, R. Englehart, G. Gardner, R. Grenier, R. Hutchinson, R. Jones, L. Kosowsky, J. Lange, N. Parmelee, A. Phillips C. Tucker, R. Wheeler
Newark: S. Amerspek, S. Klein
Saginaw Valley: J. R. Beal, L. M. Scudder
Toronto: A. Goberis, J. Greening, R. R. Irwin, P. Noy, D. C. Wilson, G. Zimmerman

DEATHS

Dallas-Ft. Worth: E. V. Adams
Mohawk Valley: H. Schnurr
St. Louis: E. S. Weil

Rhodium
ELECTROPLATING SOLUTIONS
RHODIUM
Technological knowledge acquired through many years of experience, plus special processes and equipment, assure the high quality of our Rhodium Plating Solutions.
Recommended for contact surfaces of switches, waveguide parts and other electrical applications, such as printed circuits...Can be applied in extremely heavy deposits, up to 100 milligrams per square inch.
Rhodium plating provides the advantages of whiteness, lustre and corrosion resistance of a precious metal.
Consult our staff, without obligation, about your specific plating problems.
SIGMUND COHN MFG. CO., INC.
121 SOUTH COLUMBUS AVENUE • MOUNT VERNON, NEW YORK
Specialists in the Unusual... SINCE 1901

CLASSIFIED ADVERTISEMENTS

Only "Help Wanted" and "Situations Wanted" will be accepted. Rates: $.20 per word, minimum $5.00. AES Branch Members and Members-at-Large only, in good standing, are entitled (for personal use only) to a total of three free advertisements in any twelve-month period as of first insertion. Last day for inserting advertisements is the 10th of month preceding date of publication. When answering advertisements please address as follows: Box number, PLATING, 445 Broad Street, Newark 2, N. J.

SITUATIONS WANTED

CHEMICAL ENGINEER—22 years supervisory capacity, technical and production. Background in metallurgy and electrochemistry. Diversified experience includes laboratory and processing control, electroplating, metal fabrication, finishing, heat treating, brazing and welding. Seek position of supervisory responsibility. Prefer East. Will consider other. Reply to Box M1, PLATING, 445 Broad St., Newark 2, N. J.

CHEMIST—29—3 years experience in plating research, troubleshooting, surface treatments and corrosion problems. Want position with future in electrochemical field. Interested in technical service, research and development. Will relocate. Reply to Box M2, PLATING, 445 Broad St., Newark 2, N. J.

TECHNICAL EXECUTIVE—Chemical Engineer with 17 years background in metal cleaning, aluminum, finishing, phosphatizing, and finishing equipment. Experience includes product development, manufacturing, technical service, sales promotion, direct and missionary sales, and product management. Well qualified for administrative position in any of these fields. Prefer central or eastern states location. Reply to Box M3, PLATING, 445 Broad St., Newark 2, N. J.

PLATING FOREMAN—20 years experience with nickel, gold, rhodium, tin, white copper, brass, cadmium and zinc. Age 42, married. Am looking for a position in a growing concern that has lots of opportunity for a real producer with ingenuity. I am now employed as a foreman, and have earned last year $7800. Location preferred: Connecticut, Long Island City or New York City. Reply to Box M4, PLATING, 445 Broad St., Newark 2, N. J.

PLATING SUPERINTENDENT—22 years experience, covering strip steel plating, electropolishing, hard chrome, gold and common metals plating. Age 42. 2 years college credit in Chemical Engineering. Some time study experience. Past 8 years as superintendent. Prefer relocation on West Coast. Reply to Box M5, PLATING, 445 Broad St., Newark 2, N. J.

HELP WANTED

ELECTROPLATING—TECHNICAL SERVICE—Challenging NEW staff position, reporting to the Vice President of Sales is available with a major nickel metal producer. Responsibilities will include technical liaison with customers in the electroplating, ceramics, electrical and allied industries. Qualifications: Degree in Chemical Engineering, Metallurgical Engineering or Process Chemistry; with 4 to 7 years specific electroplating experience. Location: New York City Corporation or offices of progressive mining company. Salary: OPEN—commensurate with qualifications. Reply to Box M6, PLATING, 445 Broad St., Newark 2, N. J.

TECHNICAL SALES & SERVICE—Position open in Midwest for man, preferably experienced, in calling on job and captive electroplating plants for one of the world's leading companies. Please write giving full resume of experience, age and marital status. Our fieldmen know of this advertisement. Reply to Box M7, PLATING, 445 Broad St., Newark 2, N. J.

AMERICAN ELECTROPLATERS' SOCIETY
GOLDEN JUBILEE
CONVENTION
AND
INDUSTRIAL FINISHING
EXPOSITION
AND
FIFTH INTERNATIONAL CONFERENCE
ON
ELECTRODEPOSITION & METAL FINISHING
DETROIT, MICHIGAN
JUNE 15-19, 1959

BUFFS *By* **GUARANTEED** *For Finer Finishing*

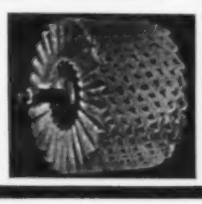
Complete Line of Guaranteed, Quality

BUFFS & POLISHING WHEELS

Straight and 45° "Spoke Buffs"
Patented, Ventilated and Biased

Serving the Finishing Industry for
MORE THAN 50 YEARS

GUARANTEED BUFF CO., Inc.
20 Vandam Street, New York 13, New York



PROFESSIONAL DIRECTORY

Commercial testing and research organizations and individuals offering services of technical nature to the metal finishing industries. Cost: $10 per inch on six time basis; $8 per inch on 12 time basis.

WILLIAM E. GRAUL
CONSULTING ENGINEER
Survey, Design, Supervision
Specialists in Plating Room
Installation Engineering
P. O. Box 66 Lansdowne, Pa.

SCIENTIFIC CONTROL LABORATORIES INC.
Finishing Consultants—Registered Prof. Engineers
Control Analyses and Tests, Salt Spray, Thickness
RESEARCH—PLANNING—DEVELOPMENT
Waste Disposal: Research and Control
Telephone: Cliffside 4-2406
3136 South Kolin Avenue Chicago 23, Illinois

SOUTH FLORIDA TEST SERVICE, INC.
TESTING—INSPECTION—RESEARCH
ENGINEERS
Consultants and specialists in corrosion, weathering and sunlight testing.
4301 N.W. 7th St. • Miami 44, Florida

GRAHAM, SAVAGE & ASSOCIATES, INC.
CONSULTING—ENGINEERING—RESEARCH
Electroplating and Metal Processing
Waste Treatment and Production Problems
Surveys—Designs—Specifications
475 York Road, Jenkintown, Pa.
1724 Clinton Street, Kalamazoo, Michigan

CUNNINGHAM ASPHALT CONSTRUCTION CO., INC.
CONSULTING ENGINEERS
Plating Room Floors
Survey—Design—Supervision
Murrayhill 2-8778-9
441 Lexington Avenue New York 17, N. Y.

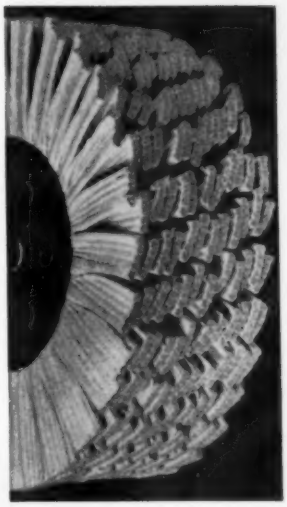
THE ANACHEM LABORATORIES
TESTING ANALYSES ENGINEERING
For Metal Finishers
Plating solution analyses and control. Testing of deposit-thickness, composition porosity, tensile strength. Salt Spray tests.
AIR FORCE CERTIFICATION TESTS
1724 West 58th St. Los Angeles 62, Calif.
AXminster 4-1262

JOSEPH B. KUSHNER, Ph.D.
Metal Finishing Counsel, training courses for plating personnel.
Box 2066, Evansville 14, Indiana

Specify the Churchill 544-RD Sisal Finger-Buff*

Especially Developed for

FAST RUGGED ACTION *on all* **HEAVY DUTY OPERATIONS**

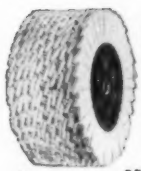


Improved construction of the sisal type No. 544-RD Churchill Finger-buff* provides new, effective cutting action . . . particularly adapted to perform the heaviest of buffing operations.

Made from the same high quality, super-twisted sisal twine as other popular Churchill sisal wheels, construction of this No. 544-RD provides a wheel in which groups of the sisal twine contained in each finger are combined to form individual units which add strength and rigidity to each finger. In addition, extra sewing on each finger aids in the maintenance of each unit under severe usage.

This new construction greatly increases the life and cutting power of this extra heavy-duty Churchill Sisal wheel type No. 544-RD.

• *Churchill Finger-Buffs* are made from sisal or cloth; always bias-cut and top grade material; in all sizes from 3" to 21" diameters.*



Geo. R. Churchill Co., INC.

The Original **FINGER-BUFFS***

(*T.M. Reg. U.S. Pat. Off.)

FREE Catalog

Hingham, Mass., (Dept. P-59)

REPRESENTATIVES IN PRINCIPAL CITIES

Please send me FREE catalog of Churchill Finger-Buffs*

Name ..... Title .....

Firm .....

Street .....

City ..... Zone..... State .....

• My special buffing problem is.....

MAY, 1959 USE READER SERVICE CARD; INDICATE A 548.

FUTURE MEETINGS

AMERICAN ELECTROPLATERS' SOCIETY

May 16,	1959—**Providence-Attleboro Branch,** Seminar "Precious Metal Finishing," Old Rhode Island College of Education Building; Banquet, University Club, Providence, R. I.
June 15-19,	1959—**Golden Jubilee Convention and Industrial Finishing Exposition, Including Fifth International Conference on Electrodeposition and Metal Finishing,** Convention Headquarters—Hotels Statler-Hilton and Sheraton-Cadillac, Detroit, Mich. Exposition—Artillery Armory, Oak Park, Mich.
August 22,	1959—**Detroit Branch Stag Day,** Detroit, Mich.
January 15-16,	1960—**Second Annual Dixie Regional Technical Session,** Saxony Hotel, Miami Beach, Florida. Sponsored by Miami Branch with Blue Ridge and Southeastern participating.
April 29-30,	1960—**Sixth Empire State Regional,** Southern Tier Host Branch, Mark Twain Hotel, Elmira, N. Y.
July 24-28,	1960—**47th AES Annual Convention,** Hotel Statler, Los Angeles, Calif.
June 18-23,	1961—**48th AES Annual Convention,** Hotel Statler, Boston, Mass.
June 25-28,	1962—**49th AES Annual Convention,** Schroeder Hotel, Milwaukee, Wis. Sponsorship Midwest Regional Council.
June 24-27,	1963—**50th AES Annual Convention,** Ambassador Hotel, Atlantic City, N. J. Sponsorship Newark Branch.

TITANIUM
for
ANODIZING RACKS
•
BAR & STRIP
•
NUTS & BOLTS
•
STANDARD RACKS & CLIPS
•
CATALOG
•
DETROIT INDUSTRIAL PROCESS COMPANY
9301 French Rd., Detroit 13, Mich. WAlnut 1-3800

USE READER SERVICE CARD; INDICATE A 549.

(continued)

INTERSOCIETY

May 16, 1959—**Masters' Electro-Plating Association of New York,** 41st Annual Banquet, Hotel Plaza, New York.

May 18-20, 1959—**Instrument Society of America,** 5th National Symposium on Instrument Methods of Analysis, Shamrock-Hilton Hotel, Houston, Texas.

May 25-28, 1959—**ASME Design Engineering Conference and Show,** Convention Hall, Philadelphia, Pa.

June 14-16, 1959—**National Assn. of Metal Finishers,** Annual Membership Meeting, Hotel Statler-Hilton, Detroit.

June 15-16, 1959—**National Association of Metal Finishers,** Management Seminar, Hotel Statler-Hilton, Detroit.

June 21-26, 1959—**American Society for Testing Materials,** 62nd Annual Meeting, Hotel Chalfonte-Haddon Hall, Atlantic City, N. J.

September 21-25, 1959—**Instrument Society of America,** 14th Annual Instrument-Automation Conference and Exhibit, International Amphitheater, Chicago.

October 7-9, 1959—**American Vacuum Society,** Sixth National Symposium on Vacuum Technology, Sheraton Hotel, Philadelphia, Pa.

October 11-16, 1959—**American Society for Testing Materials,** Pacific Area National Meeting (with Exhibit), Sheraton-Palace Hotel, San Francisco, Calif.

October 18-22, 1959—**The Electrochemical Society,** Fall Meeting, Deshler-Hilton Hotel, Columbus, Ohio.

October 21-24, 1959—**Federation of Paint and Varnish Production Clubs 37th Annual Meeting and 24th Paint Industries Show,** Convention Hall, Atlantic City, N. J.

November 5-7, 1959—**American Chemical Society,** Southeastern Regional Meeting, Symposium on Corrosion of Iron and Tin, Hotel John Marshall, Richmond, Virginia.

May 1-5, 1960—**The Electrochemical Society,** Spring Meeting, LaSalle Hotel, Chicago, Ill.

July 24-26, 1960—**National Association of Metal Finishers,** 5th Anniversary and Membership Meeting, Hotel Statler, Los Angeles, California.

July 25-26, 1960—**National Association of Metal Finishers,** 5th Anniversary Management Seminar, Hotel Statler, Los Angeles, California.

AMERICAN ELECTROPLATERS' SOCIETY, INC.
445 Broad Street
Newark 2, N. J.
Phone: HUmboldt 2-3400

OFFICERS

President.....HERBERTH E. HEAD
Engineering Division
Chrysler Corporation
Detroit 31, Mich.

First Vice President.....RALPH D. WYSONG
Studebaker-Packard Corp.
635 S. Main St., South Bend 27, Ind.

Second Vice President
DR. W. ANDREW WESLEY
The International Nickel Company, Inc.
Research Laboratory
P.O. Box U, Bergen Point Station
Bayonne, N. J.

Third Vice President....CHESTER G. BORLET
Grand Rapids Brass Co.
420 Fiftieth St., Grand Rapids 8, Mich.

Past President.....FRANCIS T. EDDY
Bayside Plating Company
1914 Harbor Boulevard, Costa Mesa, Calif.

Executive Secretary.....JOHN P. NICHOLS
445 Broad St., Newark 2, N. J.

RESEARCH COMMITTEE

Chairman.....DR. RUSSEL E. HARR
Western Electric Company, Inc.
Hawthorne Station, Chicago 23, Ill.

Vice Chairman, Research....JAMES D. THOMAS
General Motors Corporation
Box 188, North End Station
Detroit 2, Michigan

Vice Chairman, Finance.....KERGAN WELLS
W. W. Wells Ltd.
1236 Birchmount Road
Scarborough, Ontario, Canada

Secretary-Treasurer.....JOHN P. NICHOLS
445 Broad Street, Newark 2, N. J.

COMMITTEE LEADERSHIP

Credentials Committee.....Cleveland F. Nixon
Editorial Board.....John P. Nichols
Educational Committee.....Dr. Dodd S. Carr
Honorary Membership Awards Committee.....Kenneth B. Huston
Law Committee.....Manson Glover
Membership Committee....Manuel E. Ben
Paper Awards Committee...Frank O. Beuckman
Public Relations Committee.Frank Tirendi
Publications Committee....Dr. Samuel Heiman
Scientific Achievement Award.....Dr. Abner Brenner

ADVERTISING INDEX

This index is published entirely as a convenience. Every care for accuracy has been exercised. No assurance can be given, however, against inadvertent error.

A

Allied Research Products, Inc. 444, 451
Allied Chemical Corp., Solvay Process Division 457
American Brass Co., The 530–531

B

Baker Co., M. E. 532
Belke Manufacturing Co. 529
Better Finishes & Coatings, Inc. 535

C

Canadian Hanson & Van Winkle Co., Ltd. 527
Chemical Corp., The 532
Churchill Co., Inc. Geo. R. 543
Cohn Mfg. Co., Sigmund 541

D

Davies Supply & Mfg. Co. 489
Dawes' Laboratories, Inc. 529
Deering, Milliken & Co., Inc. 523
Detroit Industrial Process Co. 543
Duggan Masking Devices 538

E

Economy Engineering Co 520
Enthone, Inc. 439

F

Federated Metals Div., American Smelting & Refining Co 461
Formax Mfg. Corp. 539
Frank, Paul 454

G

Garfield Buff Co. 454
Guaranteed Buff Co., Inc. 542
Gumm Chemical Co., Inc., Frederick ..... Second Cover

H

Hanson-Van Winkle-Munning Co. ..... Third Cover
Harrison & Company, Inc. 538
Harshaw Chemical Co., The 442
Hull & Co., Inc., R. O. 452

I

Illinois Water Treatment Co. 534

K

Kocour Co. 454

L

Land, L. J., Inc. 489
Lasalco, Inc. 453
Lea Mfg. Co., The 513
Lea Ronal, Inc. 514
L'Hommedieu & Sons Co., Charles F. 447

M

MacDermid, Inc. ..... Fourth Cover
Metal & Thermit Corp. 455

O

Oakite Products, Inc. 459

P

Professional Directory 542

R

Rapid Electric Co. 446

S

Schaffner Mfg. Co., Inc. 525
Seeley Co., Inc., E. E. 519
Sel-Rex Corporation 546
Sellers Engineering Co. 440
Sethco Manufacturing Co. 489
Spraying Systems Co. 539
Stevens, Inc., Frederic B. 462, 524
Stutz Company, The 537

T

True Brite Chemicals Products Co. 517

U

Udylite Corp., The 448–449
Unit Process Assemblies, Inc. 489
Univertical Foundry & Machine Co. 519

W

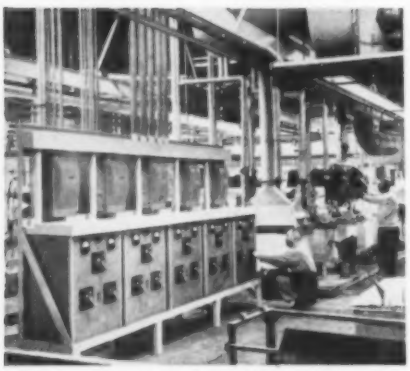
Wallace & Tiernan Inc. 522
Wyandotte Chemicals Corp. 450

Z

Zialite Corp. 520

View of monorail-automated Parker-Kalon plating facilities designed and laid-out with the assistance of Sel-Rex Engineers. Parker-Kalon has standardized with Sel-Rex plating equipment and supplies which help them to attain the quality for which P-K fasteners are famous the world over.

PARKER-KALON INCREASES PRODUCTION AND IMPROVES PLATING QUALITY WITH FIVE SEL-REX RECTIFIERS



Sel-Rex Remote Controllers shown above connect to three 16 Volt, 3000 ampere, and two 12 Volt, 2000 ampere Sel-Rex Selenium Rectifiers installed on the roof of Parker-Kalon's new 267,000 square-foot plant.

The world's leading manufacturer of self-tapping screws, Parker-Kalon division, General American Transportation Corp., Clifton, N. J., electroplates billions of screws a year in the extensive facilities pictured above. The dependable D.C. power for this tremendous operation is supplied by 5 SEL-REX Selenium Rectifiers, remotely controlled.

According to Mr. H. Rosenberg, works manager, these SEL-REX Rectifiers not only increased production appreciably, but also improved the quality of zinc, cadmium, nickel, copper and brass plating of their wide range of standard and special fasteners. SEL-REX also had the pleasure of working closely with Parker-Kalon engineers in layout and design of the special electroplating equipment required by this exacting application.

Whatever your plating problem — power, precious metals, equipment, plant layout or procedures — SEL-REX Representatives are trained to "Custom Engineer" solutions to our mutual profit. Send for FREE technical data and other case histories, and see for yourself ... we may have solved your problems last month.

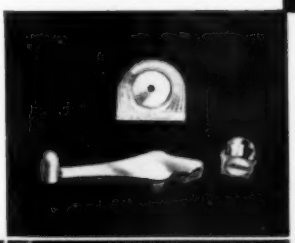
Sel-Rex®

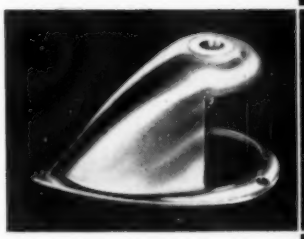
SEL-REX CORPORATION

NUTLEY 10, NEW JERSEY

Manufacturers of Exclusive Precious Metals Processes, Metallic Power Rectifiers, Airborne Power Equipment, Liquid Clarification Filters, Metal Finishing Equipment and Supplies

H-VW-M makes everything for nickel plating





Get it all from H-VW-M! Here, at one dependable source, is a complete line of processes, chemicals, equipment and supplies . . . plus expert engineering assistance.
In chemicals and supplies, here are a few examples of what H-VW-M offers . . .

H-VW-M Nickel-Lume and Levelume. These exclusive bright nickel processes combine finish brightness with exceptional ductility, high corrosion protection, economical operation. *Nickel-Lume* is recommended for still tanks, conveyors or barrels; *Levelume* for baths with air agitation and high-density currents.

H-VW-M Nickel Sulfamate Bath. 75% faster than conventional baths—plates up to 0.007" per hour, by operating at current densities as high as 140 asf. Produces a hard, ductile deposit. Process can be operated successfully with or without nickel chloride.

H-VW-M Nickel Sulphate and Nickel Chloride. For dull or high-speed bright plating solutions. Laboratory-tested by H-VW-M to assure consistent high quality. Free from organic and inorganic impurities.

H-VW-M Nickel Anodes. A full line, including all standard and many specialized shapes. New *Lo-Sludge* Anodes are used as auxiliary anodes for smooth, heavy deposition on surfaces with recessed contours. Special alloy corrodes evenly, permitting smooth build-up of nickel on hard-to-plate recessed surfaces.

H-VW-M Anode Bags. A wide variety of styles, shapes and sizes, engineered for top performance in all types of bath and anode conditions. Completely desized and preshrunk. All fabric lots are laboratory-tested *before* bags are manufactured, to assure organic purity.

Ni-Plex Nickel Stripping Compound. Fast-working . . . low in cost . . . easy on basis metals. Safe even for parts containing two or more metals. Cuts stripping costs by an average of 1¢ per square foot of 0.0001" nickel, because it remains stable at highest stripping temperatures. 1757

For information on H-VW-M processes, chemicals, supplies and engineering service, write to us at Matawan, New Jersey.

H-VW-M

HANSON-VAN WINKLE-MUNNING COMPANY
Matawan, New Jersey
Offices in principal cities

INDUSTRY'S WORKSHOP FOR THE FINEST IN PLATING, POLISHING AND ANODIZING PROCESSES • EQUIPMENT • SUPPLIES

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 551.

Only MacDermid offers metal finishers this "supermarket"

Save wasted time, frantic phone calls! Nationwide and Canadian distribution assure the most efficient service in the industry!

MacDermid
...right to the Finish!

MacDermid Incorporated
Waterbury, Connecticut, PLaza 4-6161
Ferndale, Detroit, Michigan, LIncoln 5-0064
MacDermid Pacific, Torrance, California, DAvis 3-6292

The MacDermid Man draws on the broadest line of metal cleaning, plating and finishing processes available today . . . he has complete cycle know-how.

Write for complete technical data sheets on any or all of these MacDermid processes. Your MacDermid representative has *ServiceAbility* to assist you with your *entire* metal finishing operation . . . he's a good man to know!

COMPLETE SUPPLIERS TO THE METAL FINISHING INDUSTRY

FOR FURTHER INFORMATION, USE READER SERVICE CARD; INDICATE A 552.